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ABSTRACT

This annotated bibliography focuses on individualized education, learning characteristics, and learning motivation. The reference book is intended to help teachers and administrators identify resources needed to develop teaching strategies based on up-to-date learning research and development. More than 500 technical reports, theoretical papers, practical papers, and books are listed in the bibliography. Publications are presented in five sections. In section I, research on children's learning development, instructional strategies, and instructional improvement is reviewed. Section II deals with developmental processes in mathematics, reading skills, and computer-assisted instruction. In section III, technical research and development strategies for improving classroom instruction are discussed. Section IV, the major portion of the bibliography, deals with completed projects on cognitive processes, motivation, disadvantaged youth, media and concept learning, and individualized education. The final section reviews curriculum materials on mathematical processes, reading, and prereading skills. Also included in the document are an author index, a numerical listing, and information on obtaining documents from the center. (Author/DB)

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BIBLIOGRAPHY OF PUBLICATIONS
OF THE
WISCONSIN RESEARCH AND DEVELOPMENT CENTER
FOR COGNITIVE LEARNING

Richard Rossmiller

Director

The University of Wisconsin
Madison, Wisconsin

January 1977

SO 010 479

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ERIC DOCUMENT NUMBER ADDENDUM

This insert gives ERIC Document (ED) numbers not included in this 1977 bibliography of Wisconsin R & D Center publications. It also indicates the correct ED numbers of some publications for which incorrect ED numbers are given in the bibliography. Numbers that are corrections are indicated by *. ED numbers are necessary for ordering these publications from ERIC--refer to page vi for ordering procedures.

Technical Reports

TR No.	Author(s)	ED No.
6	Lynch	010 212*
23	Conry	016 646*
52	Klausmeier et al.	023 176*
62	Van Monfrans et al.	090 510
76	Morrow et al.	064 657
119	Kamil	039 620
147	Klausmeier et al.	046 033
171	LeBlanc	053 911*
173	Pella et al.	070 658
174	Toothaker	075 491
193	Harris et al.	075 273
195	Horvitz	070 659
207	McCabe	092 975
216	Citron	070 018
230	Smith	067 610*
236	Allen et al.	070 029*
250	Levin et al.	082 143
253	Levin et al.	092 905
254	Levin et al.	092 904
259	[illegible]lark et al.	096 627
260	Farley et al.	092 990
263	Rude	095 515
264	Smith	094 354
265	Farley	094 421
266	Farley	096 648
268	Klumb	092 933
269	Kamm et al.	092 906
270	Burke-Merkle et al.	108 957
272	Nelson	094 889
273	Wiles	093 716
274	Santiago et al.	096 960
275	Jurdak	093 717
276	Walter	093 090
277	Wilder	092 982
278	Ingison	097 592
279	Wilder et al.	092 977
280	Klausmeier et al.	093 718
281	Feldman et al.	096 306
283	Ghatala et al.	094 404
285	Levin et al.	096 635
287	Klausmeier et al.	110 464
288	Klausmeier et al.	106 330
289	Kurth	109 665
291	Bernard	103 481
292	Ingison et al.	101 224
293	Pereira	098 081
295	Hooper et al.	109 149
296	Montgomery et al.	113 169
298	Evers	096 303
300	Levin et al.	097 639
301	Gargiulo	101 520
302	Buchanan et al.	103 279
309	Feldman	109 569
314	Labouvie-Vief et al.	105 348
315	Levin et al.	109 566
320	Gramenz	102 644
321	McMurray et al.	114 736
323	Levin et al.	109 664
324	Hubbard et al.	113 203
325	Zajano et al.	113 203
328	Lesgold et al.	112 584
336	Abernatha et al.	113 204
338	Quilling	117 175
339	Heckler	109 667
341	Sals et al.	109 668
342	Chester	109 618
343	Feldman	117 623*
344	Ghatala et al.	109 666
346	Johnson et al.	116 154
350	Marshall	134 611
353	Schultz	117 622
354		

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TR No.	Author(s)	ED No.	TR No.	Author(s)	ED No.
355	Ghatala	126 078	388	Klausmeier et al.	134 559
363	Venezky et al.	133 040	392	Stallard	133 708
366	Bourne et al.	116 158	393	Melvin	134 558
368	Peterson et al.	134 335	394	DeRose	133 709
373	Klopp	134 607	395	Lake	134 626
375	McMaster Part 1:	116 967	404	Katzenmeyer	134 606
	Part 2:	116 968			
380	Hooper et al. (missing from list)	128 398			

Practical Papers

PP No.	Author(s)	ED No.	PP No.	Author(s)	ED No.
9	Klausmeier et al.	039 619	14	McMurray et al.	100 720

Theoretical Papers

TP No.	Author(s)	ED No.	TP No.	Author(s)	ED No.
26	Kreitlow et al.	043 829*	50	Hooper et al.	103 129
35	Allen	064 649	54	Venezky	109 663
44	Koritzinsky et al.	085 843	55	Spuck et al.	112 869
45	Maliave	092 908	57	Hooper et al.	124 416
46	Hooper	092 907	62	Brumet	134 609
47	Labouvie-Vief	097 593			

* = corrections

WISCONSIN RESEARCH AND DEVELOPMENT CENTER FOR COGNITIVE LEARNING

MISSION

The mission of the Wisconsin Research and Development Center for Cognitive Learning is to help learners develop as rapidly and effectively as possible their potential as human beings and as contributing members of society. The R&D Center is striving to fulfill this goal by

- conducting research to discover more about how children learn
- developing improved instructional strategies, processes and materials for school administrators, teachers, and children, and
- offering assistance to educators and citizens which will help transfer the outcomes of research and development into practice

PROGRAM

The activities of the Wisconsin R&D Center are organized around one unifying theme, Individually Guided Education.

FUNDING

The Wisconsin R&D Center is supported with funds from the National Institute of Education; the Bureau of Education for the Handicapped, U.S. Office of Education; and the University of Wisconsin.

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HOW TO OBTAIN R & D CENTER DOCUMENTS

Most documents listed in this bibliography are available through the Education Resources Information Center (ERIC) and not from the Wisconsin R & D Center. The Center's past policy was to distribute free copies of research documents to interested individuals, but mailing and production costs became so high that that service has been discontinued. Public R & D Center documents are indexed in ERIC.

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RESEARCH COMPONENTS

CHILDREN'S LEARNING AND DEVELOPMENT
5.1.10.

Cognitive Operations and Abilities in Concept learning

Children's Cognitive Development and Concept Learning

Motivation-Attention Processes in Learning and Retention

Modes of Cognitive Representation

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Research Scholars:
Elizabeth S. Ghatala, Weber State University

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Adams, J. F. _Learning to learn on a concept attainment task as a function of age and socioeconomic level_. Technical Report No. 141. 42 pp. September 1970. ED 046 505.

The purpose of the study was to test the hypothesis that a learning to learn situation can identify true population differences between socioeconomic status groups. A concept attainment task was used in the study and the subjects were 7, 9, and 11 year olds from low and middle socioeconomic levels. It was expected that the low socioeconomic subjects and 9 and 11 year olds would have learning curves of increasing gains on the early problems, whereas the other subjects would have learning curves of decreasing gains.

In summary, the learning curves on all problems showed decreasing gains for both low and middle socioeconomic status children at the ages studied.

Anandalakshmy, S. _Effects of instructional intervention on performance of second grade children in a categorization game_. Technical Report No. 108. (Ph.D. dissertation) 75 pp. January 1970. ED 036 860.

Originating from an interest in the language-cognition relationship as reflected in the cognitive abilities of children, this study examined the differing theoretical implications of Piaget and Vygotsky regarding categorization.

Bender, B. G., & Levin, J. R. *Imagery generation and motor activity in young children: Trick or feat?* Technical Report No. 358. 5.1.10.30.09.01.02. 9 pp. November 1975. ED 121 447.

The purpose of this study was to determine whether motor activity, previously assumed necessary to induce imagery in young children's associative learning, actually has to be executed. The results of our experiment with kindergartners clearly suggest not. In conditions where subjects simply planned an activity (without executing it) learning was enhanced. Further. the temporal proximity of the planning to the potential motor activity did not prove to be important. These results, combined wth those from subsequent experiments, give rise to the speculation--among others--that young children can be "tricked" into imagery generation through appropriately worded instructions.

Bernard, M. E. *The uses of previously-acquired concepts: A behavior-cognitive perspective*. Theoretical Paper No. 32. 22 pp. March 1973.

This paper is a review of (a) theory and research related to how concepts are utilized in the process of learning other concepts and principles and (b) the manner in which attained concepts determine problem-solving performance. The theoretical constraints of this paper exclude both conceptual and empirical work derived from a developmental-organismic approach. Rather, the focus is on theory and research derived from both a learning and behavioral-cognitive point of view. It is concluded that concepts in the form of informational knowledge are crucial determining variables in the learning of other concepts and principles and in the problem-solving approach.

Bernard, M. E. *The empirical validation of the model of conceptual learning and development using the concept "cutting tool."* Technical Report No. 291. (Master's thesis) 5.1.10.20.03.04.05. 156 pp. December 1973.

The purpose of this study was to empirically test a set of predictions implied by the model of conceptual learning and development using the concept of *cutting tool*.

Four subtests were developed to assess a subject's ability to perform at each of four successive levels of concept attainment. In addition, three subtests were constructed to determine the extent to which a subject could use the concept *cutting tool* to cognize other concepts related to it as being supraordinate, coordinate, or subordinate; to understand cause and effect and other relationships when *cutting tool* or its attributes were incorporated in a principle; and in problem-solving situations. Each of the five major predictions specified by the model was confirmed.

Bourne, L. E., Jr. *Concept learning and thought*. Occasional Paper No. 7. 16 pp. January 1967. ED 064 661.

This paper outlines the need for an explanation of behavior which accounts for its obvious generative and recursive character. The place of thinking as a concept in psychology is discussed.

Bourne, L. E., Jr. With discussion by Thomas A. Romberg and Dorothy A. Frayer. Development of conceptual skills: Some preliminary findings. Technical Report No. 81. 18 pp. March 1969. ED 035 953.

A series of exploratory studies and three experiments dealing with conceptual role learning are reported. The results are related to subject matter fields and to educational research and development.

Bourne, L. E., Jr. Long-term retention of simple concepts. Technical Report No. 240. 11 pp. November 1971. ED 073 941.

There is little empirical evidence about the long-term retention of concepts. This study shows that bidimensional concepts about neutral pictorial material are retained nearly perfectly up through periods of one week, without intervening rehearsal or practice. The one exception is concepts based on a conditional rule, "if x, then y," learned in an attribute identification paradigm. The difficulty of this concept appears to be traceable to the asymmetry of the conditional rule and the greater susceptibility of the relevant stimulus attributes than conceptual rules themselves to forgetting.

Bourne, L. E., Jr., Dodd, D. H., Guy, D. E., & Justesen, D. R. Response-contingent postfeedback intervals in concept identification. Technical Report No. 18. 11 pp. February 1967. ED 013 980.

Two highly significant theoretical positions in the psychology of learning--incremental learning and all or none--are dealt with in the research reported.

Bourne, L. E., Jr., Levin, J. R., Konewko, M., Yaroush, R. A., & Ghatala, E. S. Picture-word differences in discrimination learning. II. Effects of conceptual categories. Technical Report No. 336. 5.1.10.30.03.01.04. 10 pp. October 1975.

College students were presented with either a pictorial or a verbal discrimination list for three trials under two conditions: (1) standard or (2) replacement of the items in each pair by different items from the same conceptual categories. Consistent with data obtained in an earlier frequency judgment experiment, and as would be predicted from the frequency theory of discrimination learning, the picture-word differences that were observed under the standard version of the task disappeared when the conceptual version was administered.

Brainerd, C. J., & Hooper, F. H. A methodological review of developmental studies of identity conservation and equivalence conservation. Theoretical Paper No. 51. 5.1.10.20.04.01.02. 20 pp. January 1975.

This study reviews the discrepant findings that have been reported on the order of emergence of identity conservation and equivalence conservation.

An analysis of the procedural details of the conflicting studies revealed that the discrepant findings probably are the result of a measurement error (judgments-plus-explanations response criteria) and a sampling error (older subject samples) committed routinely in studies reporting that identity and equivalence emerge in no fixed order. Some new data from an experiment in which these two errors were controlled provided support for this conclusion. The general consequences of measurement and sampling errors for concept development studies are discussed.

Citron, M. The effect of multimedia presentation on the inducement of synthetic concepts. Technical Report No. 216. (Master's thesis) 50 pp. March 1972.

The purpose of this study was to determine if a multimedia presentation facilitates synthetic responses. The variables, linearity and meaningfulness of the presentation, were studied using a 2 x 2 design with outside control. The five conditions were administered to 95 fifth graders. The synthetic responses were measured with three tasks. Task I consisted of a similarities judgment task, Task II was a sorting task, and Task III consisted of a questionnaire about the presentation.

An ANOVA performed on the data from the similarity judgment and sorting tasks showed no significance. A chi-square performed on the questionnaire did show significance on some questions, but these results were too isolated to accurately interpret. Descriptive analysis of the data, however, showed slight trends which would suggest that a multimedia format does facilitate synthetic responses.

Clark, C. H., & Farley, F. H. Children's processing of prose: Memory facilitation by expectation and uncertainty in text. Technical Report No. 259. 9 pp. May 1973.

The purpose of this experiment was to investigate the assumption that children's learning and retention of prose material can be differentially affected by varying discrepancy from expectation (as established by an advance organizer). It was hypothesized that a passage which significantly differed from expectation would produce heightened arousal, which should in turn facilitate long- and short-term retention as measured by fact-inference comprehension measures. Furthermore, intermediate levels of discrepancy should produce better learning and retention than either the control or the completely discrepant extremes.

From the data obtained, it was found that there was nonsignificant effect on comprehension and retention due to passage condition. The retention interval effect was significant, indicating that forgetting took place. There was also a significant interaction between comprehenson type (literal versus inferential) and retention, suggesting that the learning characterized by one type of question was retained to a greater extent than the other, or that probably the original learning of material relevant to one question type was greater than that for the other type.

Davis, J. K. Concept identification as a function of cognitive style, complexity, and training procedures. Technical Report No. 32. (Ph.D. dissertation) Out of print. 28 pp. October 1967. ED 024 167.

In two experiments the influence of cognitive style in concept identification was studied. Three levels of complexity were used in the first experiments; four training conditions in the second.

Dihoff, R. E. Multidimensional scaling of Piagetian task performance. Technical Report No. 316. 5.1.10.20.04.03.03. 92 pp. February 1975. ED 115 664.

The purpose of this study was to investigate the question of developmental synchrony within the concrete operations period described in Piagetian literature. The idea of synchrony has been challenged by Brainerd's initial groupement research, which indicated a two-dimensional structure, corresponding to class operations and relational operations.

A review of the literature indicated conflicting views concerning the nature of synchrony and how it may best be investigated. The secondary issue of distinguishing which groupements were operationalized by several traditional Piagetian tasks was explored.

Indications from this study were (1) that the class-relational distinction was not a clear-cut one; (2) considering absolute difficulty level, groupements I, II, and III were more difficult than the other five groupement tasks; however, groupement IV, also a "class" task, indicated an intermediate difficulty level in the older grades; (3) traditional Piagetian performance does not appear to be completely subsumed by the groupement tasks; and (4) nonmetric scaling and clustering techniques aid in the analysis of dichotomous, developmental data.

Farley, F. H. Memory storage in free learning as a function of arousal and time with homogeneous and heterogeneous lists. Technical Report No. 87. 8 pp. June 1969. ED 035 957.

The relation of arousal to retention in free learning was studied. Contrary to previous paired-associate studies, no significant interaction between arousal condition and retention interval was obtained, nor was reminiscence detected. The high-arousal material demonstrated greater resistance to forgetting than the low-arousal material.

Farley, F. H. Children's learning from discourse: Arousal and imagery effects on literal and inferential comprehension. Technical Report No. 266. 5.1.10.40.01.01.03. 12 pp. June 1972.

The effects of imagery instructions, word arousal value, and retention interval on children's literal and inferential comprehension of text were studied using 459 grade 3, 4, and 5 students.

Imagery instructions significantly facilitated inferential comprehension on the short-term retention test but this effect disappeared a week later. On the other hand, imagery instructions significantly impared long-term literal comprehension. Word arousal (positive effect) significantly facilitated long-term literal comprehension. Thus the only factor found to significantly enhance long-term comprehension of text was the (positive) arousal manipulation. Implications of the results for reading research were considered.

Farley, F. H. *Children's learning from discourse: Advance organizer, text sequence, and arousal effects on literal and inferential comprehension*. Technical Report No. 265. 5.1.10.40.01.01.04. 13 pp. October 1972.

The effects of arousal on literal and inferential comprehension of text over short- and long-term retention intervals were studied using 369 elementary school children. Putative arousal manipulations were of two types: (1) expectation and deviations from expectation as established by an advance organizer followed by text that for different experimental conditions varied in structure, and (2) insertion of words varying in arousal value. It was found that expectancy had no significant effect on literal and inferential comprehension at either retention interval. There was also no significant effect of the advance organizer itself. Word arousal (positive effect) significantly aided long-term literal comprehension, in line with previous work, while long-term inferential comprehension was significantly facilitated by negative effect.

Farley, F. H., & Dowling, P. M. *Experimenter by subject by retention interactions: First report*. Technical Report No. 260. 10 pp. May 1973.

Short- and long-term retention in a visual recognition memory task was studied as a function of *S*s' race using 39 students as *S*s and random polygons as stimuli. A significant interaction of race by retention interval was obtained, such that on the immediate test white *S*s obtained higher recognition scores than black *S*s, whereas on the one-week retention test recognition scores were higher for the black *S*s; black *S*s demonstrated reminiscence over the one-week interval. These results supported an earlier hypothesis by Farley of arousal, memory, and the conditions of testing in black-white learning and memory research, and suggested in addition that race of experimenter by race of *S* interactions and the choice of retention interval may be crucial to the correct analysis of black *S*s' task performance.

Farley, F. H., & Eischens, R. R. *Children's processing of prose: The effects of question arousal, text complexity, and learner strata on short- and long-term retention*. Technical Report No. 201. 12 pp. December 1971. ED 070 059.

Evidence has accumulated indicating that high arousal or activation facilitates long-term retention (LTR) but depresses short-term retention (STR) relative to low activation in list learning. The present study extended this research to the learning and retention of text by children. It specifically investigated the effects of questions inserted into two passages of prose material on STR and LTR.

An ANOVA and post-hoc pair-wise comparisons revealed the group answering questions in both passages scored significantly higher on both STR and LTR than controls, indicating a facilitative effect of adjunct questions. A text complexity and learner strata interaction was suggested.

Farley, F. H., & Manske, M. E. The relationship of individual differences in the orienting response to complex learning in kindergarteners. Technical Report No. 132. 9 pp. July 1970. ED 046 544.

This study investigated an assumption that individual differences in magnitude of the Orienting Response to a non-signal tone, measured by heart-rate deceleration, is predictive of performance in a highly unrelated learning situation. The study employed kindergarten-aged subjects of both sexes classified into High-, Medium-, and Low-Orienting Response categories.

It was concluded that this method holds promise where learning is concerned as an exceedingly early non-verbal predictor that should be free of race and social class influence.

Farley, F. H., & Schmuller, J. Children's learning from discourse: Word arousal and spread-of-arousal effects in short- and long-term retention. Technical Report No. 242. 11 pp. November 1972. ED 073 484.

The effects on short- and long-term recall of words varying in arousal value inserted into prose was studied in 720 fifth grade children. A 2 x 2 x 2 x 3 design was used consisting of two levels of word arousal value (high and low), two retention intervals (immediate and one week), two directions of the to-be-recalled words from the inserted arousal words (preceding or following the arousal words), and three distances of the to-be-recalled words from the inserted arousal words (one, three, or five words distant). Analysis of the results was based on errors, considering three error-types: extralist, intralist, and omission errors. No main effect of arousal or interaction with retention interval was obtained. The extralist error analysis revealed that high-arousal words significantly facilitated performance in a forward direction and inhibited or impaired it in a backward direction relative to the effects of the low-arousal words, which inhibited or impaired performance in a forward direction and facilitated it in a backward direction. The direction of this interaction was the same, though not significant, for omission errors. The incidence of intralist errors was so low as to render consideration of them of dubious value.

Feldman, K. V. The effects of number of positive and negative instances, concept definition, and emphasis of relevant attributes in the attainment of mathematical concepts. Technical Report No. 243. (Master's thesis) 109 pp. November 1972. ED 073 942.

Three experiments were conducted to determine the effect of several instructional variables on concept attainment. Experiment I focused on the role of teaching instances. Rationally chosen positive and negative instances were found to be more effective than positive instances alone. Experiment II was a modification of Experiment I. In each treatment condition a concept definition was given in addition to teaching instances. Presenting a definition with instances resulted in equal performance among treatment conditions regardless of the number or type of instances provided. In Experiment III the effect of presenting a rationally chosen set of positive and negative instances alone was compared with the effect of presenting this set of instances with (1) a concept definition and (2) a concept definition and emphasis of relevant attributes. Providing a set of instances with a definition was found to be more effective than the instances alone. Performance was found to increase further when the instances and definition were presented wth emphasis.

Flammer, A. *A conceptual model relating transfer of learning and correlation*. Theoretical Paper No. 43. 16 pp. July 1973. ED 085 637.

The theoretical and practical importance of the development of learning and transfer taxonomies with psychometric relevance and of the building of psychometric classificatory systems with implications for learning and instruction is discussed. Psychometric classifications of human performance most often are based on the covariation of individual differences. A model is presented which justifies the expectation that the transfer from learning one task to learning another is linearly dependent on the coefficient of intercorrelation between the two tasks when the coefficient is correlated for attenuation. Two studies so far have explicitly confirmed the main deductions from this model. Contrary to the predictions, however, the regression curves yielded negative intercepts. Two empirically testable explanations are offered, one of which would be in full accordance with the model, while the other would call for a further assumption.

Frayer, D. A., Quilling, M. R., Harris, M. L., & Harris, C. W. *Experimental approaches to establishing the construct validity of tests of concept attainment*. Theoretical Paper No. 34. 40 pp. September 1972.

The primary objective of the project entitled, "A Structure of Concept Attainment Abilities" is to formulate one or more models or structures of concept attainment abilities and to assess the consistency of each with actual data. This paper presents a symposium on construct validity of concept attainment tests which was given at the 1971 meeting of the American Educational Research Association.

Fredrick, W. C. *Information processing and concept learning at Grades 6, 8, and 10 as a function of cognitive style*. Technical Report No. 44. 51 pp. March 1968. ED 024 059.

This research deals with the relationship between an organismic factor, "cognitive style," and performance on concept learning and information processing tasks. Results showed that "high analytical" type students not only perform better on this experimental task, but they also do better in certain school subjects.

Gargiulo, R. M. *The effect of labels only and labels with instruction on the concept attainment of educable mentally retarded and normally developing boys of school age*. Technical Report No. 301. (Ph.D. dissertation) 5.1.10.20.03.04.08. 222 pp. May 1974.

The main objective of the study was to ascertain the effects of verbal labels alone and verbal labels with two kinds of instructions on concept attainment. The concept assessed was that of equilateral triangle. Eighty EMR and 80 normally developing boys of two different mental age levels were randomly assigned to one of four experimental treatment conditions: (1) verbal labels + instruction on pentagon labels, (2) verbal labels + instruction on equilateral triangle labels, (3) verbal labels only, and (4) verbal labels + instruction on cutting tool labels (control). Upon completion of the instruction in each treatment, the boys were given five subtests of the Equilateral Triangle Test Battery. The results were discussed in terms of possible educational implications.

Ghatala, E. S. Encoding verbal units in memory: Changes in memory attributes as a function of age, instructions, and retention interval. Technical Report No. 134. (Ph.D. dissertation) 83 pp. June 1970. ED 043 084.

Recognition errors of children in Grades 2, 4, and 6 were examined. Ss learned words under intentional or incidental instructions and were tested immediately or 48 hours later. Ss had to choose a target word from among acoustic, conceptual, associate, and neutral distractors.

Instructions had little effect on types of errors. Over the interval acoustic errors decreased relative to the other error types. Developmental changes in memory attributes and differential forgetting of attributes were inferred.

Ghatala, E. S. Memory attributes: Some directions for further research and implications for education. Theoretical Paper No. 27. 16 pp. December 1970. ED 046 038.

The conceptualization of memory as consisting of a collection of attributes was explored. Underwood's (1969) work on attributes of memory was reviewed. Following this, several paradigms for further research were suggested. One research paradigm dealt with individual differences and memory attributes. It was suggested that individuals may differ in the extent to which they develop or utilize certain types of attributes. A second research paradigm dealt with the types of organization imposed by a subject during the learning of a list of verbal items.

Finally, some selected research on second-order storage and retrieval plans was reviewed. Implications of research on memory attributes for education were discussed.

Ghatala, E. S., & Hurlbut, N. L. Effectiveness of acoustic and conceptual retrieval cues in memory for words at two grade levels. Technical Report No. 220. 9 pp. March 1972. ED 070 065.

The effectiveness of two types of retrieval cues was assessed with second and sixth grade children. After a single presentation of a list of words, the children first recalled as many of the words as they could. Following free recall, children in each grade were given either conceptual (category names for words on the input list) or acoustic (words which rhymed with words on the list) retrieval cues for the words missed in free recall.

For all Ss conceptual cues were more effective than acoustic cues. For sixth grade Ss both types of cues were more effective than could be expected on the basis of guessing. Second graders performed less well than sixth graders with both types of cues. While conceptual cues produced above-chance performance at the second grade level, acoustic cues did not. Results are discussed in terms of developmental changes in memory attributes.

Ghatala, E. S., & Levin, J. R. Developmental differences in frequency judgments of words and pictures. Technical Report No. 246. 16 pp. January 1973. ED 085 679.

Children in kindergarten, third grade, and fifth grade were presented a list of either pictures or words (with items presented varying numbers of times on the study trial). In both picture and word conditions, half of the Ss estimated how many times each item had been presented (absolute judgments) and the other half judged which of two items had occurred more often on the study trial (relative judgments). The primary findings were: (a) ability to encode and discriminate frequency for both pictures and words increased with age, and (b) picture-word differences (in favor of pictures) increased with age. The results lend support to a two-factor model of developmental change in frequency judgment performance involving pictures and words. The model provides for predictions concerning performance on verbal discrimination and recognition memory tasks as a function of age and stimulus mode, and also suggests further research to explain picture-word differences in verbal learning tasks.

Ghatala, E. S., & Levin, J. R. Children's discrimination learning as a function of differences in materials: A proposed explanation. Technical Report No. 283. 5.1.10.30.02.01.03. 11 pp. January 1974.

The present study affords an explanation for the consistent, but not always statistically significant, pattern showing superior verbal discrimination learning performance for low- as compared to high-frequency words. In a frequency judgment task it was found that relative to high-frequency words, low-frequency words for which Ss (sixth graders) knew the meanings produced apparent frequency measures consistent with superior verbal discrimination learning, while low-frequency words that were unknown to the children did not. These results, taken together with those based on comparisons of pictures and high-frequency words, lend themselves to a modified Weber's law interpretation of stimulus material differences in discrimination learning.

Ghatala, E. S., & Levin, J. R. Phenomenal background frequency and the concreteness/imagery effect in verbal discrimination learning. Technical Report No. 359. 5.1.10.30.03.01.01. 14 pp. October 1975. ED 116 159.

College students gave frequency ratings for concrete and abstract words which were equated on normative frequency. The results replicated the finding of Galbraith and Underwood (1973) that abstract words are perceived to be higher in frequency than concrete words. Different subjects then learned verbal discrimination lists consisting of both abstract and concrete pairs. While the usual concreteness effect was obtained when abstract and concrete items differed widely on phenomenal frequency, it disappeared when these items were equated on perceived frequency. The finding that appropriate frequency manipulations can eliminate the concreteness/imagery effect, coupled with similar findings for other stimulus characteristics, lends strong support to the frequency theory of discrimination learning.

Ghatala, E. S., Levin, J. R., & Makoid, L. A. A clarification of frequency effects in children's discrimination learning. Technical Report No. 294. 5.1.10.30.02.01.02. 16 pp. March 1974. ED 098 558.

Four experiments were conducted to assess the effects of certain stimulus variables on children's discrimination learning. In general, it was found that word frequency was negatively related to discrimination learning as long as the words were meaningful to Ss. Moreover, the relationship between word frequency and performance reversed in free-recall learning, as was expected. Equivalent relationships between frequency and learning were obtained with verbal and pictorial materials. The implications of these results were discussed in the context of popular accounts of memorial representation.

Ghatala, E. S., Levin, J. R., & Subkoviak, M. J. Rehearsal strategy effects in children's discrimination learning: Confronting the crucible. Technical Report No. 335. 5.1.10.30.09.01.04. 18 pp. June 1975. ED 113 698.

This study incorporated a correctional methodology into an experimental context to determine the functional components of rehearsal strategies in children's discrimination learning. As anticipated on the basis of previous research, when a discrimination list was administered in the absence of explicit rehearsal instructions, the subjects' ability to discriminate situational frequencies proved to be an important predictor of performance. However, when the same list was administered in the company of either an imagery or vocalization rehearsal strategy, frequency discrimination ability as a predictor was supplanted by the subjects' ability to discriminate between previous usages and nonusages of the strategy. The results are discussed in terms of Underwood's individual differences crucible for theory construction.

Ghatala, E. S., Levin, J. R., & Wilder, L. Apparent frequency of words and pictures as a function of pronunciation and imagery. Technical Report No. 238. 9 pp. November 1972.

A sample of sixth graders was asked to estimate how many times each item in a list of either word or picture stimuli (presented varying numbers of times on a study trial) had been displayed. It was found that, in comparison to words, pictures (a) were judged as having occurred more frequently, (b) resulted in less variable within-subject judgments, and (c) produced fewer "false alarms" on items never presented during study. At the same time, instructions to pronounce or to image the stimuli on the study trial had no effect on frequency judgments, either as a main effect or in interaction with stimulus types. The results were interpreted in terms of existing frequency theory, and permitted for speculations regarding picture-word differences in verbal learning experiments.

Ghatala, E. S., Levin, J. R., & Wilder, L. Pronunciation and the frequency-meaningfulness effect in children's frequency discrimination. Technical Report No. 344. 5.1.10.30.03.01.02. 9 pp. May 1975.

In an absolute frequency judgment task, independent groups of sixth grade children received either high-frequency (Hi-F), low-frequency, high-meaningfulness (Lo-F/Hi-M), or low-frequency, low-meaningfulness (Lo-F/Lo-M) words under either pronounce or silent conditions. Results indicated that the accuracy of subjects' judgments followed the previously found frequency meaningfulness pattern (Lo-F/Hi-M words were judged more accurately than Hi-F words, whereas Lo-F/Lo-M words were not) only when the words were pronounced. Stated differently, pronunciation was found to increase accuracy for Lo-F/Lo-M words substantially more than it did for the other materials. The effect of pronunciation on the accessibility of word meaning was discussed.

Golub, L. S., Fredrick, W. C., & Harris, M. L. Measuring language arts concept attainment: Boys and girls. Technical Report No. 199. 25 pp. November 1971. ED 065 894.

Test development efforts for constructing 12 items to measure achievement of each of 30 selected language arts concepts are described. Item and total score statistics for data collected on 186 boys and girls who had just begun the sixth grade are presented and discussed.

Gonchar, A. J. A study of the nature and development of the natural number concept: Initial and supplementary analyses. Technical Report No. 340. 5.1.10.20.04.03.11. 126 pp. July 1975. ED 118 417.

The present two-phase study sought to investigate the structural isomorphic relations between the cognitive skills which presumably underlie number competence as formalized by Piaget (1866) and the actual performance patterns of children when confronted with task problems requiring logical reasoning and involving number-related concepts for their solutions. In the main study, the accuracy of Piaget's predictions concerning the developmental priority and inter-patterning of relations between emergent cognitive competencies of classes and relations was assessed. In the second phase of this investigation, an attempt was made to reconcile Piaget's model and recent experimental evidence in support of an ordinal sequence in the development of the natural number concept.

The results of the main study suggested a developmental picture in which the concepts of classes and relations evolve co-jointly with the natural number concept among which a universal and invariant sequence is not apparent. This does not necessarily suggest the absence of any functional developmental connection among the elements of relations, classes, and number. The strong values of association registered between concepts, the high proportion of subjects with concordant rankings, and the lack of a clear developmental sequence suggested that there is a possible underlying affiliation between the concept of relations and the concept of classes in the construction of the natural number concept.

In sum, the findings of this investigation are in agreement with Piaget's contention that cognitive development is dialectical in nature. Without further logitudinal follow-up, it would be conjecture to conclude definitively from the data that Piaget's model of number development (being the resultant of the synchronous emergence of relational and classification competencies) is upheld.

Harris, M. L., & Golub, L. S. *An analysis of content and task dimensions of language arts items designed to measure level of concept attainment*. Technical Report No. 200. 37 pp. November 1971. ED 065 885.

Content and task dimensions of language arts items were studied using factor analytic techniques. These items were developed to measure concept attainment using a completely crossed design with 30 concepts and 12 tasks. Conventional factor analyses were performed, separately for boys and girls, for concept scores and for task scores. Three-mode factor analyses were performed.

The main conclusions drawn from the results of the conventional factor analyses are that all 30 of the concepts are measures of a single functional relationship existing among the concepts, and that all 12 tasks are measures of a single underlying ability or latent trait. The three-mode results indicate that there are no important concept-task interactions for the idealized person; thus it is reasonable to regard the concepts and the tasks as being two independent modes.

Harris, M. L., & Harris, C. W. *Analysis of dimensions of a battery of reference tests for cognitive abilities: Fifth grade boys and girls*. Technical Report No. 192. 94 pp. November 1971. ED 069 763.

Three systems for defining general cognitive abilities were analyzed to determine the nature of possible reference tests for cognitive abilities: the Guilford analysis of cognition, the Guttman facet design, and the Primary Mental Abilities of the Thurstones. This analysis led to a fourth schema for classifying abilities that deal with cognizing concepts. A battery of 56 tests was developed to study the relationships among the four schemata. Data for the 56 tests were collected on 172 boys and 210 girls who had just completed the fifth grade.

Six sets of derived factors, three orthogonal and three oblique, were interpreted. Six clear comparable common factors and one that is fairly clear were obtained for boys. The six clear comparable common factors appear to represent most closely six of the seven Primary Mental Abilities. The comparable common factor that is fairly clear may be a missing Primary Mental Ability--Spatial Ability. Five clear comparable common factors obtained for girls appear to be five of the seven Primary Mental Abilities.

Harris, M. L., & Harris, C. W. *Item analyses and reliabilities for reference tests for cognitive abilities: Fifth grade boys and girls*. Technical Report No. 191. 23 pp. November 1971. ED 070 020.

Test development efforts for constructing 35 of the tests included in a battery of 56 tests of possible cognitive abilities are described. Data were collected on 172 boys and 210 girls who had just completed the fifth grade. Item and total score statistics obtained for the 56 tests in the total battery are presented and discussed.

Harris, M. L., & Harris, C. W. Three systems of classifying cognitive abilities as bases for reference tests. Theoretical Paper No. 33. 33 pp. November 1971. ED 070 021.

Three systems for defining cognitive abilities, proposed by Guilford, Guttman, and the Thurstones, are examined as bases for specifying reference tests for cognitive abilities. The authors propose the cognition of concepts system as a fourth alternative. Tests constructed and/or adapted on the basis of this examination are described.

Harris, M. L., & Romberg, T. A. An analysis of content and task dimensions of mathematics items designed to measure level of concept attainment. Technical Report No. 196 39 pp. November 1971. ED 070 660.

Content and task dimensions of mathematics items were studied using factor analytic techniques. These items were developed to measure concept attainment using a completely crossed design with 30 concepts and 12 tasks. Conventional factor analyses were performed, separately for boys and girls, for concept scores and for task scores. Three-mode factor analyses were performed.

The main conclusions drawn from the results of the conventional factor analyses are that all 30 of the concepts are measures of a single functional relationship existing among the concepts, and that all 12 tasks are measures of a single underlying ability or latent trait. The three-mode results indicate that there are no important concept-task interactions for the idealized persons; thus it is reasonable to regard the concepts and the tasks as being two independent modes.

Harris, M. L., & Romberg, T. A. Measuring mathematics concept attainment: Boys and girls. Technical Report No. 195. 29 pp. November 1971. ED 070 659.

Test development efforts for constructing 12 items to measure achievement of each of 30 selected mathematics concepts are described. Item and total score statistics for data collected on 196 girls who had just completed the fifth grade during early summer of 1970 and 195 boys who had just begun the sixth grade during the fall of 1970 are presented and discussed.

Harris, M. L., & Tabachnick, B. R. Measuring social studies concept attainment: Boys and girls. Technical Report No. 193. 31 pp. November 1971.

Test development efforts for constructing 12 items to measure achievement of each of 30 selected social studies concepts are described. Item and total score statistics for data collected on 196 girls who had just completed the fifth grade and 195 boys who had just begun the sixth grade are presented and discussed.

Harris, M. L., Tabachnick, B. R., & Huysamen, G. An analysis of content and task dimensions of social studies items designed to measure level of concept attainment. Technical Report No. 194. 43 pp. November 1971. ED 068 410.

Content and task dimensions of social studies items were studied using factor analytic techniques. These items were developed to measure concept attainment using a completely crossed design with 30 concepts and 12 tasks. Conventional factor analyses were performed, separately for boys and girls, for concept scores and for task scores. Three-mode factor analyses were performed.

The main conclusions drawn from the results of the conventional factor analyses are that all 30 of the concepts are measures of a single functional relationship existing among the concepts, and that all 12 tasks are measures of a single underlying ability or latent trait. The three-mode results indicate that there are no important concept-task interactions for the idealized persons; thus it is reasonable to regard the concepts and the tasks as being two independent modes.

Harris, M. L., & Voelker, A. M. An analysis of content and task dimensions of science items designed to measure level of concept attainment. Technical Report No. 198. 29 pp. November 1971. ED 065 348.

Content and task dimensions of science items were studied using factor analytic techniques. These items were developed to measure concept attainment using a completely crossed design with 30 concepts and 12 task scores. Three-mode factor analyses were performed.

The main conclusions drawn from the results of the conventional factor analyses are that all 39 of the concepts are measures of a single functional relationship existing among the concepts, and that all 12 tasks are measures of a single underlying ability or latent trait. The three-mode results indicate that there are no important concept-task interactions for the idealized persons; thus it is reasonable to regard the concepts and the tasks as being two independent modes.

Haveman, J. E., & Farley, F. H. Arousal and retention in paired-associate, serial, and free learning. Technical Report No. 91. Out of print. 18 pp. July 1969. ED 035 959.

In an effort to investigate the relationships between arousal and long-term learning recall, arousal was manipulated by white noise during paired-associate, serial, and free learning in three experiments. The results suggested that the effects of arousal are dependent on the nature of the material to be processed and the intensity of arousal.

Hawkins, P. D. Hypostatization of selected environmental concepts in elementary school children. Technical Report No. 215. (Master's thesis) 61 pp. March 1972. ED 070 022.

This investigation studied the effectiveness of implicit analogies as advance organizers in children's learning. It was hypothesized that analogies which were structurally isomorphic to the target concept would facilitate learning of the latter even though linkages between components of the two concepts were not overtly specified.

Ninety-six sixth graders from a rural Wisconsin middle school served as subjects. Subjects in the experimental condition initially read an advance organizer describing an occupational hierarchy which was structurally isomorphic to the ecological hierarchy described in the experimental passage. One control condition received an irrelevant advance organizer containing significant terms from the job description embedded in a story. The second control condition received no advance organizer.

Results of the study showed no significant effects of the advance organizer. Interpretation remains unclear, however, since a number of confounding factors may have been involved and several alternative explanations are plausible.

Hooper, F. H. Life-span analyses of Piagetian concept tasks: The search for nontrivial qualitative change. Theoretical Paper No. 46. 5.1.10.20.04.01.01. 21 pp. September 1973.

The implications of a life-span developmental prospective for Piagetian theory and research are discussed. Initially, certain recent criticisms of the Piagetian system are evaluated. These include the interpretation of Piaget's abstract model of logical reasoning; his views concerning the interrelationship of hereditary, maturational, and socio-experiential factors; the similarities and contrasts present in the Genevan viewpoint and neo-Hegelian dialectical approaches; and the possibility of continued developmental change following the adolescent years. It is maintained that most of these possible shortcomings are the result of incorrect secondary interpretations or misunderstandings of the Piagetian viewpoint as represented in Piaget's own writings.

A brief overview of the research on Piagetian concept development beyond the years of adolescence is presented. These cross-sectional assessment studies which have included samples of elderly subjects have generally found marked differences favoring the mature adult subsamples, similarities between the performances of the young children and aged subject subsamples, and/or apparent decrements in the performances of the elderly persons on the Piagetian tasks. The systematic incorporation of these findings into a life-span model of cognitive development has yet to be accomplished.

In a concluding section the philosophical, methodological, and practical implications of a straightforward acceptance of a life-span orientation are discussed. While the methodological concerns are extremely complex, they are, in principle, resolvable. More importantly, the acceptance of a life-span perspective demands a parallel adherence to a philosophical world view (i.e., the organismic) which expects multiple causation to be the rule and which places an emphasis upon the study of individuality.

Hooper, F. H., Brainerd, C. J., & Sipple, T. S. A representative series of Piagetian concrete operations tasks. Theoretical Paper No. 57. 5.1.10.20.04.02.01. 92 pp. September 1975.

As an integral step in a comprehensive, four-year longitudinal analysis of concept development, a series of logical concept tasks based upon Piagetian theory, and suitable for administration to individuals five years of age or older, are described. The developmental focus was the logical groupements associated with the concrete operations period of middle-childhood. Sixty-four binary choice items were devised; one half of these assessed the operation of logical composition while the remainder assessed the inverse operation and reciprocal operation. In addition, complementary concrete operations tasks, adapted from the procedures of previous normative investigations, were administered.

A sample of 180 children received the concept task series. Significant sex differences and order of presentation effects were generally absent. As anticipated, grade-level main effects were significant for the great majority of the tasks. Initial psychometric analyses utilizing coefficient alpha indicated a generally satisfactory level of internal consistency for the present task series. The Hoyt reliability values for the various groupements comparisons ranged from .62 to .91. It was concluded that the concept task series provides a generally reliable assessment of logical reasoning during the middle-childhood years.

Hooper, F. H., & Sipple, T. S. An investigation of matrix task classificatory and seriation abilities. Technical Report No. 348. 5.1.10.20.04.03.02. 39 pp. September 1975. ED 117 894.

Matrix tasks to assess multiple classification and multiple seriation skills were administered to 160 children. Each child received six matrix subtasks (reproduction and transposition of cross classification I, double seriation, and cross classification II) in one of six orders of presentation. Preliminary analyses indicated a general absence of significant presentation order effects and an absence of sex differences. Grade level comparisons were significant for all subtasks except one.

These results (1) confirm previous findings concerning the generally lesser difficulty of matrix reproduction compared to transposition; (2) are in contrast to previous research regarding the difficulty of class and series matrices; and (3) suggest that development in classificatory abilities may lag behind relational abilities contrary to the structural predictions of orthodox Piagetian theory.

Hooper, F. H., Sipple, T. S., Goldman, J. A., & Spencer, S. S. A cross-sectional investigation of children's classficatory abilities. Technical Report No. 295. 5.1.10.20.04.03.01. 90 pp. February 1974.

A series of Piagetian concrete operations period tasks dealing with classificatory concepts was administered to 280 children (40 subjects from each of seven levels). As anticipated, significant main effects for age were found for all the tasks. Few significant sex differences were observed. Scaling analyses of the pass/fail patterns indicated a generally reliable (reproducibility coefficients of .91-.93) order of difficulty: (1) free sorting (2) double series matrix reproduction (3) cross class matrix reproduction (4) cross class matrix transposition (5) "Some-All" understanding (6) double series transposition (7) producing three exhaustive sortings (8) class inclusion understanding (9) combinatorial reasoning. Factor analysis of a subset of the tasks indicated that three principal components were necessary to account for 85 percent of the performance variance. Thus, a nonunitary structure was found for the children's performances across the present task array and age range. In general agreement with the original contentions of Inhelder and Piaget, it was concluded that the child's understanding of the logic inherent in class inclusion relationships evolves gradually and is contingent upon the previous mastery of certain less complex classificatory skills.

Hooper, F. H., Swinton, S. S., & Sipple, T. S. *An initial analysis of concrete operations task performances and memory variables for children aged 5 to 13 years*. Technical Report No. 371. 5.1.10.20.04.03.07. 107 pp. July 1976.

The initial and second years' performances of a sample of children aged 5 to 13 years on a representative series of concrete operations period logical reasoning tasks and memory measures are reported. These results represent the initial phase of a comprehensive longitudinal/cross-sectional assessment project conducted over four years.

Preliminary analyses indicated a generally satisfactory level of internal consistency reliability across the task array and an absence of significant order of presentation or school location effects.

It was concluded that the best characterization of the concrete operations period is a complex interrelationship pattern which is multi-dimensional in nature. The transition from preoperational forms of logical reasoning to a full mastery of the concepts derived from the logical *groupements* appears not be be a punctate, discontinuous phenomenon with uniform progress for the various task settings.

Horvitz, J. M. *The use of imagery instructions in children's learning as a function of age*. Technical Report No. 159. (Master's thesis) 66 pp. April 1971.

This study was an attempt to investigate concurrently the usefulness of imagery instructions in learning PA nouns embedded in sentences and conjunction phrases with three different age groups: third grade, sixth grade, and college students. In addition, six different item types were employed in order to convey increasingly dissimilar contexts from study to test trials.

It was concluded that imagery is a useful mediator for sixth graders and above, while third graders are too developmentally immature to utilize self-generated imagery; semantic factors in learning are important, but imagery instructions used effectively may facilitate learning regardless of the semantic context involved.

Horvitz, J. M. Transfer in children's paired-associate learning as a function of levels of meaning. Technical Report No. 313. (Ph.D. dissertation) 5.1.10.30.08.01.03. 84 pp. January 1975. ED 105 445.

The study was designed to assess whether negative transfer in children's paired-associate learning could be reduced by changing the levels of meaning at which stimuli were encoded on the two lists. Stimuli and instructions were specifically designed to approximate three levels of meaning postulated by Paivio (representational, referential, and associative). It was hypothesized that changes in meaning levels from first to second list would result in less interference than conditions where stimuli remained at constant levels of meaning over lists. Another facet of the study was designed to test the encoding variability hypothesis with children, which suggested that less meaningful stimuli would be subject to less interference.

Three separate experiments were conducted. The hypotheses were not confirmed by any of the three experiments. Results were discussed in terms of possible characteristics of the learners and the stimuli that may have contributed to the nonsignificant findings.

Houston, T. R., Jr. Comparable common factors in English homophone recognition. Technical Report No. 163. (Ph.D. dissertation) 168 pp. March 1971. ED 056 045.

A list of 7,300 English homophones was compiled and used to contruct two tests. Scores were obtained on these and on reference tests for J. P. Guilford's factors CMU, CSU, DMU, DSU for 70 native speakers of midwestern American English from a university population. The homophone tests showed Hoyt reliabilities of .95 and .87 for these subjects.

Following Harris's procedure for determining Comparable Common Factors, a 15 x 15 matrix of intercorrelations was subjected to three factoring procedures, each yielding oblique and orthogonal solutions. Results were in close agreement for all analyses, yielding three common factors. Two corresponded to CMU and to DMU. The CSU and DSU tests loaded on the third factor, which had its largest loading on the homophone tests, and involved comparing verbal stimuli with formal elements of internally generated lists. These findings replicate Harris's failure to extract distinct CSU and DSU factors, and suggest that homophone recognition tasks can provide short but reliable reference tests for the symbolic factor into which CSU and DSU coalesce.

Hubert, L. J., & Levin, J. R. A general statistical framework for assessing categorical clustering in free recall. Theoretical Paper No. 58. 5.1.10.30.09.01.07.01. 28 pp. October 1975. ED 116 162.

A graph-theoretic paradigm is used to generalize the common measures of categorical clustering in free recall based on the number of observed repetitions. Two graphs are defined: a graph G that characterizes the *a priori* structure of the item set defined by a researcher, and a graph R that characterizes a subject's protocol. Two indices of clustering, denoted by lambda and omega, are obtained by evaluating the sum of the pairwise products of the weights on the corresponding edges of the two graphs. The lambda statistic is a direct generalization of the commonly used clustering indices and reduces to the number of repetitions whenever G represents a standard categorical decomposition of a stimulus list. The omega statistic, on the other hand, extracts more information from the protocol graph R than does lambda and incorporates a distance measure based on the number of intervening items in a subject's recall sequence.

Hubert, L. J., & Levin, J. R. *Evaluating priority effects in free recall*. Theoretical Paper No. 66. 5.1.10.31.01.01.14. In press.

Ingison, L. J. *Effects of attribute identification pretraining on rule effects in attribute identification transfer tasks*. Technical Report No. 278. 5.1.10.20.03.04.03. 13 pp. November 1973.

An attempt was made to reduce or eliminate rule effects in attribute identification (AI) tasks through AI pretraining. Thirty-six twelfth grade volunteers received 0, 4, or 8 AI problems prior to transfer to a final AI task. Results showed that, even at the highest level of pretraining, rule effects were present at transfer. These findings were discussed in terms of the possible factors contributing to AI rule effects.

Ingison, L. J., & Levin, J. R. *The effect of children's spontaneous stimulus preferences on discrimination learning*. Technical Report No. 292. 5.1.10.10.01.01.01. 11 pp. February 1974.

Two experiments investigated the role of children's spontaneous conceptual "biases" in pictorial discrimination learning. The results suggested that such biases may serve either to facilitate or to interfere with discrimination learning. Moreover, in each experiment, age by treatment interactions revealed that in comparison to the behavior of older children (sixth graders), that of younger children (kindergartners) is governed more by the perceptible than by the functional attributes of stimuli. These data are in complete accord with Bruner's view of cognitive development.

Jones, D. L. *Relationships between concept learning and selected ability test variables for an adult population*. Technical Report No. 51. Out of print. 57 pp. May 1968. ED 024 331.

A verbal concept-learning task suitable for college students was devised which permitted the externalizing and quantifying of behavior at six points in the learning process. The learning task and 16 nonarbitrarily selected ability tests purporting to measure reasoning, memory, and verbal factors were administered to 102 college females.

Jones, M. E., & Farley, F. H. *Short- and long-term retention as a function of variations in stimulus and response interestingness*. Technical Report No. 150. 19 pp. December 1970. ED 046 032.

The purpose of this study was to investigate the effect of interestingness as a variable in paired-associate learning and retention. A pilot study with 45 subjects was used to construct paired-associate lists of three levels of interestingness (high, middle, low) and controls over associative properties of stimulus and response terms. In the main study, subjects were randomly assigned to the nine different lists and to short- vs. long-term retention intervals. A significant interaction between interest and short- vs. long-term retention was not obtained.

Kalish, P. W. _Concept attainment as a function of monetary incentives, competition, and instructions_. Technical Report No. 8. (Master's thesis) 16 pp. September 1966. ED 010 510.

The three main purposes of this study were to compare the effects on concept-attainment behavior of optimal and minimal instructions, two levels of monetary incentives, and high and low competition. Error scores on a classification test for each concept were used in the analysis.

Kaplan, S. A. _Elaboration and reading achievement as factors in children's learning of text materials_. Technical Report No. 180. (Master's thesis) 41 pp. September 1971.

This experiment investigated sentence facilitation of paired-associate learning using connected text rather than the unrelated, simple sentences of previous research. Each of 64 fifth graders, classified either as High or Low reading achiever, was assigned to one of four presentation conditions: hear sentences/read sentences with instructions to learn about the story, hear sentences/read sentences with instructions to learn the pairs of underlined words, hear sentences/read pairs, and hear pairs/read pairs. This study replicated other recent experiments which have failed to find sentential facilitation of PA learning when the sentences were both heard and read. For the High readers, learning was facilitated when the sentences were heard but only the pairs were read, while the Low readers performed better when both elaboration and instructions to learn the pairs were given than where either elaboration or instructions was missng. The results of this study demonstrated the importance of achievement level to PA learning and suggested the application of elaboration research findings to school learning.

Katz, S. E. _The effect of each of four instructional treatments on the learning of principles by children_. Technical Report No. 381. (Ph.D. dissertation) 5.1.10.20.03.04.09. 256 pp. in 2 parts. February 1976.

This study investigated the effect of each of four instructional treatments on the learning of principles by children. Three types of instructional lessons were developed to represent one major internal and two external conditions proposed to facilitate principle learning.

The three instructional conditions were manipulated by presenting a single instructional condition or by presenting a pair of instructional conditions to form the four treatment conditions. The fifth experimental condition consisted of a control group that received placebo lessons.

Mastery of the principles, the dependent variable, was measured by a test designed to assess subjects' comprehension of and ability to apply the principles. Classificatory and formal level mastery of the major concepts related in each principle were also assessed.

Providing instruction on the principle itself, which includes as its major instructional component a rational set of examples and non-examples of the principle, was found to be significantly more facilitative in promoting the learning of the principles than a condition of no instruction. In addition a close direct relationship was found between mastery of the principles and mastery of the major concepts related in the principles.

Kerst, S. M. Short- and long-term effects of experimenter-imposed and subject-generated sentence and image mediators on paired-associate learning in children. Technical Report No. 233. (Master's thesis) 45 pp. September 1972. ED 067 608.

A paired-associate learning task, with labeled pictures as stimuli and responses, was administered to a sample of fourth and fifth grade children. Sentence and imagery mediators which linked the stimulus and response terms were either provided by the experimenter or generated by the children themselves under instructions from the experimenter. Children were tested by the recognition method after each of two study trials (study-test method). In addition, they were tested after an interval of one week to assess the long term effects of the treatments. It was found that both experimenter-imposed and subject-generated sentence and image mediators improved performance at acquisition, and that these effects persisted when subjects were tested again one week later. Moreover, children who had been instructed to generate their own mediators transferred this strategy without further instruction to a new list given during the second session a week later. To evaluate the importance of mediator recall to response recognition, children in the imposed mediator conditions were asked to recall the provided mediators after they had been retested (during the second session) for recognition of all responses. The proposition that recall of the mediator was a necessary but not sufficient condition for the occurrence of the facilitative experimental effects was essentially supported.

Kerst, S. M. Interactive mental imagery and short-term memory search rates for words and pictures. Technical Report No. 317. (Ph.D. dissertation) 5.1.10.30.08.01.11. 92 pp. August 1974. ED 105 448.

Independent groups of Ss compared a test word with a set of one to three words held in short-term memory (STM) to determine if the test stimulus was a member of the memory set. The rate of STM search was obtained by measuring reaction-time (RT) under four instructional conditions: (1) Subvocal Repetition, where Ss repeated the words in the memory set to themselves, (2) Separation Imagery, in which Ss generated a separate covert visual image of the referent of each word, (3) Interaction Imagery, in which Ss imagined a scene where the referents of the words were interacting, and (4) Sentence Generation, where Ss composed an active covert sentence using the words in the memory set.

It was predicted that items combined in an interactive image in memory could all be compared at once to the test stimulus, so that reaction-time would remain constant in spite of an increase in the size of the memory set. All conditions, however, yielded a linear increase in RT with set size.

A second experiment, in which the memory set and test stimuli were both pictorial, produced similar results. Even though visual imagery apparently united the pictured pairs of objects in long-term memory (as indicated by paired-associate recall), it did not affect the nature of the STM search, since RT was a linear function of set size in all conditions.

Klausmeier, H. J., Allen, P. S., Sipple, T. S., & White, K. M. _Second cross-sectional study of attainment of the concepts "equilateral triangle," "cutting tool," "noun," and "tree" by children age 6 to 16 of City B._ Technical Report No. 347. 5.1.10.20.03.03.08. 130 pp. January 1976. ED 128 394.

Theory and research regarding four levels of concept attainment and three uses of concepts as specified by the Conceptual Learning and Development (CLD) model are described. The strategy and objectives of a longitudinal assessment of children's conceptual learning and development are presented. The role of cross-sectional investigations in the longitudinal assessment is discussed; design and results of the first cross-sectional research are reviewed.

For this study, the second in the cross-sectional series, assessment batteries were developed to determine each child's level of attainment and related use of the concepts _equilateral triangle_, _cutting tool_, _noun_, and _tree_. Batteries were designed as paper-and-pencil tasks and were administered to children enrolled in each of four grades: first, fourth, seventh, and tenth.

Predictions based on the model about children's conceptual development were strongly supported across concepts.

Klausmeier, H. J., Ghatala, E. S., & Frayer, D. A. _Levels of concept attainment and the related cognitive operations._ Theoretical Paper No. 40. 26 pp. November 1972. ED 073 410.

This paper is a refinement of a model of conceptual learning and development presented initially as the Presidential Address to Division 15, Educational Psychology, of the American Psychological Association in September 1971 at Washington, D.C. Thus it supersedes the initial formulation in explicitness and detail.

This paper explains the nature of concepts with which the model deals. An overview of the model is presented which indicates that concepts are attained at four successive levels--concrete, identity, classificatory, and formal. It further explains how concepts attained at the classficatory or formal level may be used. The cognitive operations essential for attaining concepts at each of the successive levels are indicated. The role of language in the attainment of concepts is examined. The various internal and external conditions of concept learning are indicated. The research and theory on which the model is based are presented.

Klausmeier, H. J., Sipple, T. S., & Allen, P. S. First cross-sectional study of attainment of the concepts "equilateral triangle," "cutting tool," and "noun" by children age 5 to 16 of City A. Technical Report No. 287. 5.1.10.20.03.03.05. 59 pp. February 1974.

Theory and research regarding four levels of concept attainment and three uses of concepts as specified by the conceptual learning and development (CLD) model are described.

For this study, assessment batteries were developed to assess each child's level of concept attainment and also the related use of the concepts equilateral triangle, cutting tool, and noun.

Predictions were strongly supported across all three concepts:

1. The three concepts were attained in an invariant sequence according to four successive levels: concrete, identity, classificatory, and formal.
2. As the concepts were attained to higher levels they were used increasingly (a) in cognizing supraordinate-subordinate relationships in a hierarchy; (b) in understanding principles that stated a relationship between the attained concept and one or more other concepts; and (c) in solving problems that required the use of the particular concept.
3. Having the labels of the concept and of its defining attributes facilitated (a) attainment of the concept, and (b) mastery of the three uses of the concept.

Klausmeier, H. J., Sipple, T. S., & Allen, P. S. First cross-sectional study of attainment of the concepts "equilateral triangle" and "cutting tool" by children age 5 to 16 of City B. Technical Report No. 288. 5.1.10.20.03.03.06. 47 pp. February 1974.

Subjects at three age levels were administered picture pair or word pair discrimination lists. They pronounced or pointed as a method of choice, and they pronounced or pointed at the correct item (or remained silent) during rehearsal. The results indicated that with picture pairs, pronunciation facilitated learning as a method of choice and a type of rehearsal in nursery school Ss. For fifth grade and college Ss, there was no significant difference between pronouncing and pointing as a method of choice. However, spoken rehearsal was superior to control performance for fifth grade Ss. College Ss performed equally well in the control and pronouncing condition, but pointing during rehearsal produced significantly more errors than pronouncing. Word pairs produced no significant pronunciation effects. These results were discussed within an internalization of speech prespective.

Klausmeier, H. J., Sipple, T. S., & Frayer, D. A. *An individually administered test to assess level of attainment and use of the concept "equilateral triangle."* Technical Report No. 257. 5.1.10.20.03.04.02. 30 pp. August 1973. ED 088 931.

Theory and research regarding four levels of concept attainment and three uses of concepts as specified by the model of conceptual learning and development (CLD) are described. Subtests, utilizing three-dimensional stimuli, were developed to assess each level of attainment and each use of the concept *equilateral triangle*. The tests were administered individually to 40 children at each of seven grade levels: preschool, kindergarten, second, fourth, sixth, eighth, and tenth.

Major predictions were confirmed: (1) mastery of the concept levels and the uses increased with increased age, (2) the four levels were attained according to an invariant sequence, and (3) the higher the level of concept attainment the more effective was the use of the attained concept.

Klausmeier, H. J., Sipple, T. S., Allen, P. S., & White, K. M. *Second cross-sectional study attainment of the concepts "equilateral triangle," "cutting tool," "noun," and "tree" by children age 6 to 16 of City A*. Technical Report No. 367. 5.1.10.20.03.03.07. 124 pp. January 1976. ED 128 395.

Theory and research regarding four levels of concept attainment and three uses of concepts as specified by the conceptual learning and development (CLD) model are described. The strategy and objectives of a longitudinal assessment of children's conceptual learning and development are presented. Perspective is provided regarding the role of cross-sectional investigations in the longitudinal assessment; design and results of the first cross-sectional research are reviewed.

For this study, the second in the cross-sectional series, assessment batteries were developed to determine each child's level of concept attainment and also the related use of the concepts *equilateral triangle*, *cutting tool*, *noun*, and *tree*. Batteries were designed as paper-and-pencil tasks and were administered to children enrolled in each of four grades: first, fourth, seventh, and tenth.

Predictions based on the model about children's conceptual development were strongly supported across concepts.

Kumar, K., & Farley, F. H. *Influence of temporal parameters and intensity of post-learning arousal change on long-term retention*. Technical Report No. 160. 23 pp. April 1971. ED 051 538.

This study was designed to examine the effects on long-term retention of variations in intensity and temporal parameters of arousal following a single learning trial in a paired-associate task. The *S*s were 56 female university students. Intensity of arousal was manipulated by using two levels of white auditory noise and a condition without white noise. Noise was delivered to the *S*s through earphones at three temporal intervals following a learning trial. The results are discussed in terms of a multi-stage analysis of memory consolidation and directions for further research are outlined.

Labouvie-Vief, G. *Learning and intelligence: A review of empirical and theoretical issues*. Theoretical Paper No. 47. 5.1.10.10.01.02.01. 18 pp. November 1973.

The relationship between learning ability and intelligence has continually been a focus of theory and research. It is argued in this paper that the inconclusive results of studies relating individual differences variables such as intellectual abilities to learning are due to a too pragmatic, atheoretical orientation. Theoretical models explicating the role of individual differences constructs are examined in a developmental context and compared wth empirical efforts to cross-link components of intelligence and learning. In contrast to earlier evaluations, this review suggests that cross-linkages are often meaningful, systematic, and interpretable and that they may form the building blocks for inclusive conceptualizations of intellectual development which pay attention to both treatment and individual differences variance.

Labouvie-Vief, G., & Levin, J. R. *The relationship between recall performance and abilities: A second look*. Technical Report No. 314. 5.1.10.10.01.02.02. 16 pp. July 1974.

This paper reports an attempt to replicate previously published findings on the interrelationship between free-recall performance and selected cognitive abilities. In Experiment I, 300 seventh and twelfth graders responded to a battery of eight intelligence and memory tests and were then randomly assigned to one of three pre-learning instructional conditions (control, organizational chunking, and rote rehearsal). In Experiment II, 120 third and tenth graders were asked to recall items either immediately or following a 30-second delay (the latter presumably fostering conceptual activity). Utilizing a rote-conceptual distinction as potentially relevant in mediating interrelations between abilities and learning, the authors expected that systematic differentiated patterns of recall-ability covariation would emerge as a function of age, practice, and experimental treatment. However, most of the predictions were not confirmed, even those serving to replicate the previous findings. It is argued that such negative results necessitate a closer examination of the underlying theoretical model--specifically, a more thorough consideration of the appropriate treatment conditions and ability markers.

Lemke, E. A., Klausmeier, H. J., & Harris, C. W. *The relationship of selected cognitive abilities to concept attainment and information processing*. Technical Report No. 11. 17 pp. October 1966. ED 010 513.

The effects of eight convergent cognitive abilities on concept attainment behavior were studied under selection and reception learning conditions. Thirty-four task and ability variables were intercorrelated, then analyzed using Alpha techniques.

Levin, J. R. *Treatment by age interactions: The problem and a solution*. Theoretical Paper No. 41. 2 pp. November 1972. ED 073 411.

A rationale is presented for considering treatment by age interactions in a relative rather than in an absolute sense. An appropriate data transformation is derived that enables a researcher to interpret such interactions statistically.

Levin, J. R. What have we learned about maximizing what children learn? Theoretical Paper No. 49. 5.1.10.30.08.02.01. 27 pp. July 1974. ED 101 318.

A summarization of a program of research in children's learning is presented. Major topics include the effects of pictures and visual imagery on children's cognitive performance. The role of individual differences is highlighted throughout the paper, as are variables which potentially limit the effects discussed. Continued investigation into the nature and development of cognitive processes is indicated.

Levin, J. R., Bourne, L. E., Jr., Yaroush, R. A., Ghatala, E. S., DeRose, T. M., & Hanson, V. Picture-word differences and conceptual frequency judgments. Technical Report No. 323. 5.1.10.30.03.01.03. 12 pp. March 1975.

Recent evidence suggests that whereas pictures are more easily recognized, discriminated, associated, and recalled than their corresponding verbal labels, this is not the case in concept acquisition/utilization tasks. If such evidence is interpreted in terms of a "frequency theory" perspective, one would expect the typically obtained frequency judgment difference between pictures and words to be reduced if "conceptual" frequency judgements are required. This expectation was confirmed in three experiments.

Levin, J. R., & Ghatala, E. S. More about rehearsal strategy effects in children's discrimination learning. Technical Report No. 370. 5.1.10.31.01.01.02. 34 pp. April 1976.

In a recently reported study, the functional components of imagery and vocalization strategies in children's verbal discrimination learning were examined. This research extends those results to a strategy which (unlike imagery and vocalization) has a positive influence on subjects' simple frequency discriminations. It was found that for such a strategy, both subjects' ability to discriminate frequency as well as their ability to discriminate their previous rehearsal activity are positively correlated with discrimination learning performance. A number of theoretical implications of these findings are discussed.

Levin, J. R., Ghatala, E. S., & DeRose, T. M. The effect of stimulus prefamiliarization on children's discrimination learning. Technical Report No. 285. 5.1.10.30.02.01.01. 7 pp. January 1974.

Previous research has shown that stimulus prefamiliarization retards subsequent verbal discrimination learning in adults. In one experiment of the present study, children learned a discrimination list consisting of picture pairs following prefamiliarization with either the same or irrelevant materials. The same conditions were investigated in a second experiment using high-frequency words as materials. A significant negative effect of prefamiliarization was found in both experiments. It was concluded that the effect of stimulus prefamiliarization generalizes across stimulus materials (pictures and words) and across age levels (adults and elementary-school children). Suggestions for future research are offered.

Levin, J. R., Ghatala, E. S., DeRose, T. M., & Makoid, L. A. Image tracing: An analysis of its effectiveness in children´s pictorial discrimination learning. Technical Report No. 352. 5.1.10.30.09.01.03. 13 pp. October 1975. ED 116 160.

Previous research has demonstrated that requiring children to trace from memory the correct member of a pictorial discrimination pair markedly facilitates performance. In two experiments reported here an analysis was made of the effective components of this learning strategy. On the basis of the evidence assembled it was concluded that the "memory image" component of the strategy appears to be important. Specification of the relationship of this "memory image" component to contemporary explanatory constructs such as "depth of processing" and "dual coding" awaits further research and analysis.

Levin, J. R., Ghatala, E. S., DeRose, T. M., Wilder, L., & Norton, R. W. A further comparison of imagery and vocalization strategies in children´s discrimination learning. Technical Report No. 299. 5.1.10.30.02.01.04 13 pp. May 1974. ED 098 557.

Three experiments were conducted to determine the effectiveness of verbal and imaginal rehearsal strategies in children´s discrimination learning. With verbal materials, imaging the referent of the correct item was more facilitative than vocalizing the correct item, as long as the former strategy was defined in a manner conducive to effective imagery generation. In fact, when children engaged in such a strategy, their verbal discrimination performance was virtually error free. No difference between the two strategies was found in pictorial discrimination learning, both resulting in performance very near ceiling. A possible interpretation of the results is provided.

Levin, J. R., Ghatala, E. S., & Wilder, L. Picture-word differences in discrimination learning: I. Apparent frequency manipulations. Technical Report No. 253. 5.1.10.30.01.01.02. 7 pp. May 1973.

A discrimination learning task was administered to a sample of sixth graders. Stimulus materials consisted of either pictures or words for which frequency judgments had been obtained in a previous experiment. Picture and word items were selected which differed either substantially or minimally in apparent frequency measures. While the usual picture-over-word effect was found when picture-word apparent frequency differences were large, it vanished when pictures and words were equated in terms of apparent frequency. These results, coupled with some recent data, provide for a fairly complete account of picture-word differences in discrimination learning.

Levin, J. R., Ghatala, E. S., Wilder, L., & Inzer, E. *Imagery and vocalization strategies in children's verbal discrimination learning*. Technical Report No. 221. 9 pp. April 1972. ED 065 895.

The verbal discrimination learning of elementary school children was assessed in two experiments. In both experiments, *S*s were given either regular discrimination learning instructions (control), instructions to pronounce the correct pair member aloud three times during study trials (vocalization), or instructions to generate a visual image of the correct pair member during study trials (imagery). Experiment 1 employed a mixed list of homonym, synonym, and unrelated noun pairs. The results of the two experiments provided partial support for the proposition that a particular rehearsal strategy would be facilitative only when it provided a discriminative cue which was relevant to the materials on hand.

Levin, J. R., Labouvie-Vief, G., & Urberg, K. A. *Cognitive abilities and strategies in children's paired-associate learning*. Technical Report No. 315. 5.1.10.10.01.02.03. 9 pp. July 1974.

The paired-associate learning of 52 fourth graders was related to measures of cognitive ability obtained the previous year. Subjects were administered the paired-associate task under one of three variations: at a comfortable rate with standard instructions; at a comfortable rate with a potentially effective learning strategy (visual imagery); and at a speeded rate with standard instructions. As anticipated on the basis of earlier research with children of this age, the relationship between reasoning (as reflected by Raven's Progressive Matrices) and learning was augmented when subjects were supplied wth the imagery strategy and diminished when the task was speeded. Negligible correlations between rote memory (as reflected by digit span) and learning were obtained under all task variations. Interpretations of the results and speculations for future research are included.

Levin, J. R., McCabe, A. E., & Bender, B. G. *Imagery induction in the pre-imagery child*. Technical Report No. 282. 5.1.10.30.08.01.10. 9 pp. July 1974. ED 100 528.

This study extends some recently acquired knowledge about the development of visual imagery as an associative-learning strategy. Incorporating the present findings into the data already gathered it appears that as a facilitator, sentence production precedes imagery generation in that preoperational children benefit from instructions to engage in the former though not in the latter. Moreover, the provision of relevant motor activity, which has been shown to induce imagery generation in six year olds, has at best a variable effect on the performance of three and four year olds.

Levin, J. R., Wolff, P., Davidson, R. E., & Rohwer, W. D., Jr. *Issues in imagery and learning: Four papers*. Theoretical Paper No. 36. 44 pp. February 1972. ED 064 648.

The papers included here are based on a 1971 symposium held at the annual meeting of the Western Psychological Association in San Francisco. The first three papers report the results of research carried out over the last few years at the Wisconsin Research and Development Center for Cognitive Learning. Levin's paper focuses on the effectiveness of verbal and imaginal cognitive strategies, and their development with age. Surprisingly, the age variable represents a relatively recent consideration in experiments in which subjects are required to generate their own dynamic visual representations. Wolff's paper summarizes research in which the developmental course of imagery production is tied to the early sensorimotor activity of the young child. Davidson examines another theoretical issue: the relationship between imagery and language processes in the child, and the broader question of whether imagery is inextricably linked to meaning. Rohwer's paper deals with a recurring theme in imagery research, namely the difficult-to-determine task and population validities for supposedly easy-to-determine phenomena. He documents the fact that well-established findings based on one set of operations may not be extended easily to tasks involving different materials or to demographically different populations.

Lovejoy M. A., & Farley, F. H. *The relationship of arousal during learning to short- and long-term retention employing two indices of arousal.* Technical Report No. 184. 20 pp. November 1971. ED 064 650.

This experiment tested the hypothesis that paired-associate learning accompanied by high arousal should lead to stronger permanent memory and weaker immediate memory than paired-associate learning accompanied by low arousal. During continuous recording of skin resistance and heart rate as measures of arousal, 32 Ss were given a one-trial, eight-item paired-associate task consisting of zero percent association value nonsense syllables as stimulus terms and the digits 2 to 9 as response terms. The Ss were tested for recall following either a 2.87-minute or 24-hour interval. When skin resistance was used as a measure of arousal, the results confirmed the hypothesis. There was a significant interaction between arousal level and time of recall under conditions of high and low arousal as defined by amount of galvanic skin response deflection. Retention for material learned under low arousal decreased rapidly over 24 hours. High-arousal learning, on the other hand, showed no significant effect on retention.

Lynch, D. O. *Concept identification as a function of instructions, labels, sequence, concept type, and test item type.* Technical Report No. 6. (Master's thesis) Out of print. 16 pp. June 1966. ED 101 212.

The effects of instructions and three stimulus variables--type of label, type of concept, and sequence of concepts by type--are investigated in the described study. Performance was analyzed in terms of four types of test items.

Makoid, L. A. *The effects of labeling and meaningfulness on children's pictoral discrimination learning.* Technical Report No. 331. 5.1.10.30.02.01.05. 44 pp. April 1975. ED 105 447.

The purpose of the experiment was to assess the effects of real and nonsense pictures witn no labels, or with high- or low-frequency labels, in discrimination learning of young children (second graders). In general, it was found that the picture-over-word effect was operating, although not as in previous research with older subjects. There was a slight increase in performance when the nonsense pictures were labelled, but there was little or no indication of a word-frequency effect (low- over high-frequency words).

Manske, M. E., & Farley, F. H. Individual differences in the orienting response and arousal as factors in the short- and long-term retention of children in grades K-4. Technical Report No. 161. 20 pp. June 1971. ED 057 403.

The present experiment investigated the assumptions that (1) individual differences in the orienting response (OR), as measured by heart rate deceleration to a nonsignal tone, can be used to predict retention in a pictorial paired-associate task; and (2) that arousal level during learning, as assessed by either heart rate or blood volume changes, interacts with short- and long-term memory. Specifically, it tested the hypothesis that learning under conditions of high arousal should lead to stronger permanent memory and weaker immediate memory than learning under conditions of low arousal. When digital vasoconstriction was used as the measure of arousal, the results confirmed the hypothesis.

Marliave, R. S. A reanalysis of the need to achieve and its relationship to education. Theoretical Paper No. 42. 14 pp. June 1973. ED 085 643.

A review of the literature indicates that measures of the McClelland-Atkinson need-Achievement (nAch) construct are weak in terms of both reliability and validity. Whereas score-rescore and interrater reliabilities are reasonable, test-retest reliability (stability) is poor. This indicates that nAch reflects situational variables rather than enduring personality variables. The validity of the model is upheld only in terms of risk-taking relationships wherein persons high in nAch prefer tasks of intermediate risk (probability of failure or success). The most serious weakness of the model's validity is the lack of evidence for the hypothesized positive relationship between nAch and performance. In addition, the inverse relationship between the probability of success and the incentive value of success was not supported.

The nAch model is shown to be closely related to expectancy theory. Theories of locus of control and attribution are found to be useful in understanding the need for achievement. The success of the nAch construct in predicting risk preference is explained with an analysis of the information obtainable by attempting tasks of different probabilities of success. Moderate risks are shown to offer maximum information, whereas tasks of high or low risk offer minimum information. Hence, what has been termed "need Achievement" is reconceptualized as the willingness to seek information about one's own performance capacity. This, in turn, is related to processes of social comparison.

The basic implication for education of this reanalysis of the need for achievement is that information on academic performance must be presented in such a way as to minimize threats to the student's self-esteem. The analysis is related specifically to individualization of instruction and integration of classrooms.

Marliave, R. S. Selective attention and cognitive learning. Theoretical Paper No. 45. 5.1.10.20.01.02.02. 13 pp. September 1973.

The relationship between selective attention and learning is investigated. It is proposed that two forms of attention exist. "Inspectional" attention is a simple matching process, where perceived stimuli are compared with an internal model of the stimulus for which the individual is searching. "Comprehensional" attention combines the inspectional process with more complex cognitive operations. The stimuli which are searched for and recognized with comprehensional attention must be simultaneously processed with these cognitive operations. It is shown that this added complexity of comprehensional attention has physiological concomitants of inspectional attention.

The functions of selective attention in learning are also examined. Emphasis is placed upon the role of attention in developmental changes that usually occur in the 5 to 7 year age range. Transposition, reversal shift, and conservation learning processes are considered. The function of attention in these learning processes is related to "blocking effects" and "surprise." Stimulus novelty and complexity are shown to arouse comprehensional attention, thereby facilitating learning. It is suggested that comprehensional attention may be crucial to cognitive restructuring (learning).

Marliave, R. S. The effects on concept attainment of instructing children to hypothesize and evaluate. Technical Report No. 383. (Ph.D. dissertation) 5.1.10.20.03.04.06. 241 pp. in 2 parts. February 1976.

This study was designed to investigate the effects on concept attainment of training for hypothesizing and evaluating defining attributes. The Model of Conceptual Learning and Development indicates that a S able to classify examples and nonexamples of a concept, as well as discriminate and name its defining attributes, should be able to attain the formal level of the concept by hypothesizing, remembering, and evaluating its defining attributes. This study is concerned with the sufficiency of hypothesizing, remembering, and evaluating for formal level concept attainment among Ss able to classify examples and nonexamples and to discriminate and name attributes.

The results of the study did not show the training for hypothesizing and evaluating to be sufficient for formal level concept attainment among Ss able to classify examples and nonexamples and to discriminate and name attributes. However, specific transfer effects of the hypothesizing and evaluating training were found for hypothesis generation and evaluation as measured by the oral instrument.

McCabe, A. E. An investigation of the motor activity and sentence production in young children. Technical Report No. 207. (Ph.D. dissertation) 5.1.10.30.08.01.02. 71 pp. August 1973.

The present study deals with young children's ability to generate sentences, either overtly or covertly, with concurrent relevant motor activity. Sixty children at each of the two age levels, 4 years and 7 years, were employed as subjects.

A paired-associate (PA) learning task paradigm was employed with children's toys used as the PA items. The six treatment groups at each of the two age levels consisted of three verbalization instructions--overt sentence, covert sentence, or covert naming--under either manipulation or no manipulation instructions. Children were instructed to generate interactions between the pair members by manipulating the toys behind a screen and/or by producing sentences. Measures of PA recall, sentence quality, and quality of manipulations were obtained.

From this data it appears that children as young as 3 1/2 to 4 1/2 years of age are capable of generating sentences covertly if given the appropriate instructions. This contradicts previous statements regarding the inability of young children to do so.

McCabe, A. E., Levin, J. R., & Wolff, P. The role of overt activity in children's sentence production. Technical Report No. 251. 9 pp. April 1973. ED 084 031.

The ability of nursery school children to associate pairs of toys was assessed under four experimental conditions: (a) control, (b) S manipulating the toys, (c) S generating a sentence, and (d) S generating a sentence while manipulating the toys. All three S-involvement conditions produced significantly better recognition performance than the Control, but contrary to initial predictions, the difference between the Sentence and Manipulation Plus Sentence conditions was not significant. In contrast to previous research, Ss in the Sentence condition had little difficulty producing sentences when asked. Of interest was the finding that the quality of sentence production was poorer in the Manipulation Plus Sentence condition than in the Sentence condition. Results are discussed in terms of the possible "conflict" produced when the child is required to engage in more than one overt activity at the same time.

Miller, G. W., & Davis, J. K. Retention and concept identification as functions of concept complexity, method of presentation, stimulus exposure time, and conditions of recall. Technical Report No. 54. 44 pp. May 1968.

Three laboratory experiments were performed with college students to investigate concept identification and recall of information as a function of four selected variables: concept complexity, method of instance presentation, stimulus exposure time, and conditions of recall.

Mizelle, R. M., & Farley, F. H. Learning as a function of stimulus and response arousal with control over meaningfulness, imagery, and concreteness. Technical Report No. 165. 15 pp. June 1971. ED 057 405.

The contribution to learning of the learning materials' arousal properties was investigated using degree of interest of the stimulus and response terms as the index of arousal. Words equated on meaningfulness, imagery, and concreteness and rated as high, medium, and low in interest were used to represent the three levels of interest, and served as stimulus and response terms. Ninety students were randomly assigned to one of the nine treatment conditions consisting of variations in interest on the stimulus and response side.

The results revealed no significant difference between groups or within groups. The planned comparison suggested that the greatest amount of learning occurred in medium levels of response interest. However, high, medium, and low response effects were not significantly different from each other at conventional levels. The inverted U suggested in this study is in line with certain previous research.

Nelson, B. A. Effects of the analytic-global and reflectivity-impulsivity cognitive styles on the acquisition of geometry concepts presented through emphasis or no emphasis and discovery or expository lessons. Technical Report No. 234. (Ph.D. dissertation) 139 pp. September 1972. ED 070 679.

Studies were designed to identify two learning styles. The organismic variables, the analytic-global cognitive style and the reflectivity-impulsivity cognitive style, which were chosen, were hypothesized to affect the operations of discriminating attributes and inferring the concept.

Study I was designed to look at the effect of the analytic-global cognitive style on the acquisition of three geometry concepts presented through written lessons which did or did not contain verbal emphasis of the relevant attributes. Study II was designed to look at the effect of the reflectivity-impulsivity cognitive style on the acquisition of three geometry concepts presented through discovery or expository lessons.

It was found that Ss who were able to perceptually separate a simple figure from a complex background performed significantly better on a test assessing attainment of geometry concepts, especially on items assessing discrimination of relevant attributes than Ss deficient in this ability.

Nelson, G. K. A study of classificatory behavior in low socioeconomic status children of varying characteristics. Technical Report No. 181. (Master's thesis) 120 pp. October 1971. ED 058 325.

The purpose of this study was to determine the relationship of method of presentation, grade level, sex, and achievement within grade and sex to the various bases upon which children of low socioeconomic background classify geometric concepts. Two tasks were administrered to 96 subjects in the fifth, eighth, and eleventh grades--32 at each grade level. Task I was an equivalence task comprised of a sequential presentation of eight geometric concept cards. Half the Ss were given a verbal presentation while the other half were given a pictorial presentation. Ss were asked to explain likenesses and differences between stimuli. Task II was a free sorting exercise. Ss were presented with a 26-item picture array, asked to select from the array the cards which were alike, and to explain the bases of their groupings. Task I responses were classified into Perceptible, Attribute, Nominal, and Subject-Fiat categories; for Task II responses, only Perceptible, Attribute, and Nominal categories were used.

This study found, contrary to expectation, that low SES children in grades five, eight, and eleven do not vary significantly from one another in their bases of classifying geometric figures. Achievement, method of presentation, and sex were also found to be a not significant influence on bases of classification.

Nelson, G. K. Concept formation and the development of language. Theoretical Paper No. 37. 19 pp. May 1972. ED 070 089.

This paper examines possible interchanges between cognitive and language processes with particular attention given to concept formation and semantic language development. Aspects of psychological and contemporary linguistic theories are discussed as a way to interrelate the functions of thought and language. It is concluded that semantic growth is largely a matter of verbal concept learning.

Nelson, G. K. Sensory-motor and verbal foundations of concept acquisition: A study in early childhood. Technical Report No. 272. (Ph.D. dissertation) 5.1.10.20.03.04.04. 159 pp. August 1973.

One hundred children of three and five years of age were trained and assessed individually on the concept of equilateral triangle at three levels of attainment. Group 1 was asked to visually inspect geometric blocks which represented positive and negative instances of the concept. Group 2 was given verbal orienting instruction that called attention to relevant physical properties of the stimuli, along with visual inspection. Group 3 was given free haptic play and tactile-kinesthetic training with the stimuli to supplement visual inspection. Group 4 had a combination of manual activity and verbal instruction to supplement visual inspection. Group 5 engaged in unrelated play activity (control). The amount of time for training was equalized for the various conditions.

A day after training had been completed each subject's knowledge of the concept was tested at three levels: concrete, identity, and classificatory. Each task was scored for total number of correct responses. Generally, the combination of manual activity and verbal orienting instruction with visual inspection (Group 4) was the most effective treatment condition.

Osborne, J. W., & Farley, F. H. Individual differences in arousal and their relationship to short- and long-term retention. Technical Report No. 139. 26 pp. March 1971. ED 049 512.

In two separate paired-associate learning experiments each employing 40 employing 40 university students as Ss, the contribution of individual differences (IDs) in arousal to short- and long-term retention was investigated using IDs in salivary response to lemon juice stimulation as an index of arousal. Experimental Ss were pre-selected out of 184 Ss on the basis of extreme arousal scores.

The hypotheses were tested that high-arousal learning would lead to poor short-term retention but would demonstrate reminiscence or superior long-term retention relative to low-arousal learning; low arousal learning was expected to lead to superior short-term retention but classical forgetting over the long term relative to high-arousal learning.

Experiment One yielded (nonsignificant) results in the predicted direction, whereas Experiment Two, incorporating procedural changes on the basis of Experiment One, confirmed the hypotheses.

Rampaul, W. E. The relationship between conceptual learning and development, concept achievement, and selected cognitive abilities. Technical Report No. 382. (Ph.D. dissertation) 5.1.10.20.03.04.07. 121 pp. March 1976.

The main aim of this investigation was to gain a more complete understanding of concept attainment across subject matter fields and according to age levels. Tests on noun, tree, and equilateral triangle, based on the specifications of the model of conceptual learning and development (CLD model); specially constructed concept achievement tests drawn from language arts, science, and mathematics; selected Stanford achievement tests in the same subject matters; and selected cognitive ability tests were administered to 100 children in grade four and 102 children in grade seven.

The results should prove useful to curriculum developers and textbook writers who prepare instructional materials for children.

Santiago, S., & Farley, F. H. Intrinsic and induced arousal in the short- and long-term comprehension of film content by elementary school children in Puerto Rico. Technical Report No. 274. 5.1.10.40.01.01.09. 29 pp. February 1973.

This study was designed to examine the contribution of intrinsic arousal (individual differences) and induced arousal to children's comprehension of film content with short- and long-term retention intervals. Intrinsic arousal was measured by a salivary response measure; induced arousal was manipulated by white auditory noise. The latter was presented while the Ss viewed a silent single-concept film on science. Both literal and inferential comprehension measures were used. Results showed that there was no significant main effect of intrinsic arousal level. However, there was a significant interaction between intrinsic arousal and white noise. There was also a significant interaction effect between intrinsic arousal and retention interval and between white noise and retention interval. The results were discussed in terms of action decrement and inverted-U models of arousal and learning.

Scott, J. A. Lessons on selected geometry concepts written in expository and discovery modes of presentation and a test of concept mastery. Practical Paper No. 13. 212 pp. September 1972.

The lessons and test which comprise this paper were used in two experiments which studied the effects of discovery and expository modes of presentation on retention and transfer. The methodology and results of the experiments are briefly summarized. Eight lessons are included: (a) two introductory lessons; (b) three lessons in the expository mode, one on triangles and two on quadrilaterals; and (c) three lessons in the discovery mode, one on triangles and two on quadrilaterals. Also included is a 28-item multiple-choice test dealing with concepts presented in the quadrilateral lessons.

Severson, H. H., & Farley, F. H. The identification of individual differences in the strength of the nervous system. Technical Report No. 162. 20 pp. April 1971. ED 051 539.

This study attempted to investigate the hypotheses set forth by Russian researchers that there may be identified a pervasive characteristic of the central nervous system labeled as "strength." Ten of the 12 measures used in the study were direct replications of representative strength measures derived from the Russian work. Two additional measures were included to test the possible relationship between strength and "arousal."

The study employed 33 graduate students as Ss. The measures used included Absolute Visual Threshold, Auditory Threshold, 2-Flash Threshold, and Reaction Time, with the remaining variable derived by systematically varying experimental conditions.

A factor analysis provided no clear-cut support for a dimension of strength although a number of less pervasive factors were obtained. Discriminate function and regression analyses supported this general conclusion. The discussion centered around methodological issues and an apparent dimension of arousal.

Snartemo, K. L. The effect of drawing training on young children's paired-associate learning as a function of socioeconomic level and mode of presentation. Technical Report No. 405. (Ph.D. dissertation) 5.1.10.31.01.01.11. In press.

Swanson, J. E. The effects of number of positive and negative instances, concept definition, and emphasis of relevant attributes on the attainment of three environmental concepts by sixth grade children. Technical Report No. 244. (Master's thesis) 155 pp. November 1972. ED 073 412.

Three main studies were conducted to determine the effect of certain independent variables (number of positive and negative instances, presence or absence of a concept definition specifying the defining attributes, and presence or absence of emphasis of relevant attributes) on the learning of environmental concepts. Sixth grade children who participated in the experiments each read a series of three printed lessons and took four tests dealing with the concepts population, habitat, and community. Five dependent measures were used to assess concept attainment. The results showed that: (1) presenting examples and non-examples in a rational teaching set promoted correct classification of unencountered instances; (2) removal of negative instances from the rational teaching set resulted in significant overgeneralization; (3) providing a concept definition with the rational set of 3 or 4 instances and 3 or 4 noninstances was not more effective in promoting concept learning than providing the rational set alone; and (4) providing a rational set of instances and noninstances together with concept definition and emphasis of relevant attributes was more effective in promoting recognition of new instances than a presentation of teaching instances plus definition without emphasis.

Toniolo, T. A., & Hooper, F. H. Micro-analysis of logical reasoning relationships: Conservation and transitivity. Technical Report No. 326. 5.1.10.20.04.03.05. 70 pp. April 1975. ED 115 020.

An investigation into the distinction between identity conservation and equivalence conservation was examined in two content areas, length and weight. In addition, transitivity of length and weight was examined in relationship to conservation.

Subjects were assigned to one of six different counter-balanced orders of presentation for the conservation and transitivity task battery. The design was a 3/2/2/2 mixed-model analysis of variance. The factors were age (preschool/kindergarten/third grade), task (identity/equivalence), criterion (judgment only/judgment plus explanation), and content area (length/weight).

The main effects of age, task, and criterion were large and highly significant. Equivalence conservation was observed to be of greater difficulty than identity conservation. More trials were passed under the judgment only criterion than with a judgment plus explanation criterion. Significant interaction of Age x Task, Task x Criterion, and Age x Criterion were also observed.

Varley, W. H., Levin, J. R., Severson, R. A., & Wolff, P. Training imagery production in young children through motor involvement. Technical Report No. 252. 9 pp. May 1973. ED 084 032.

Kindergarten and first grade children were given a paired-associate learning task following one of five types of strategy-training procedures. In the motor-training conditions, Ss generated interactions involving pairs of toys by playing with them or by drawing pictures of them. It was found that relative to simple imagery practice, motor training facilitated the performance of kindergartners, with no differences among four motor-training variations. In the first grade, imagery practice by itself was as effective as each of the motor-training procedures. The results are discussed in terms of Piaget's theory of cognitive development and contrasted with previously unsuccessful attempts to induce self-generated elaboration strategies in young children.

Voelker, A. M., & Harris, M. L. Measuring science concept attainment of elementary school boys and girls. Technical Report No. 197. 29 pp. November 1971. ED 070 661.

The procedures employed in constructing and revising 12-item tests of concept attainment for 30 selected science concepts are described. The total score and individual item statistics for data collected on a group of beginning sixth grade children are presented and discussed. Separate data analyses are presented for the boys and the girls.

Wilder, L. Analysis training: Failure to replicate Elkonin. Technical Report No. 202. 13 pp. January 1972. ED 070 067.

This experiment was an attempt to replicate a sound-discrimination training procedure reported by Elkonin (1963). Eight kindergarten Ss were given a training list composed of five words made up of nine sounds. Experimental Ss learned to discriminate the sounds making up the words with the aid of pictures representing the words as well as tokens to represent the sounds. Control Ss did not receive picture and token training.

There were no significant differences between the experimental and control Ss on training or transfer lists. This failure to replicate was discussed in terms of age of Ss, possible differences between American and Soviet children, and time spent during training. It was suggested that future research should focus on younger children.

Wilder, L. Recent developments in Soviet research on the verbal control of voluntary motor behavior. Technical Report No. 277. 5.1.10.30.07.02.02. 11 pp. October 1973.

This paper, which reports the results of the author's information-gathering trip to Moscow and Kiev, U.S.S.R., in June-July 1972, was presented at the Biennial meetings of the International Society for the Study of Behavioral Development, August 1973. It is suggested that "voluntary behavior" is only that behavior which is verbally controlled, and that such behavior is disturbed when the verbal instructions conflict with the child's own movements (stereotypia), or with his immediate perceptions (echopraxia).

Wilder, L., & Levin, J. R. A developmental study of pronouncing responses in the discrimination learning of words and pictures. Technical Report No. 228. 9 pp. October 1971. ED 073 444.

Subjects at three age levels were administered picture pair or word pair discrimination lists. They pronounced or pointed as a method of choice, and they pronounced or pointed at the correct item (or remained silent) during rehearsal. The results indicated that with picture pairs, pronunciation facilitated learning as a method of choice and a type of rehearsal in nursery school Ss. For fifth grade and college Ss, there was no significant difference between pronouncing and pointing as a method of choice. However, spoken rehearsal was superior to control performance for fifth grade Ss. College Ss performed equally well in the control and pronouncing condition, but pointing during rehearsal produced significantly more errors than pronouncing. Word pairs produced no significant pronunciation effects. These results were discussed within an internalization of speech perspective.

Wilder, L., Levin, J. R., Ghatala, E. S., & McNabb, S. Pronunciation and apparent frequency in a between-subjects design. Technical Report No. 241. 9 pp. October 1972. ED 074 513.

College students were administered a list of middle-frequency words, in which individual words were presented from one to six times. Half the Ss pronounced the list, while the other half remained silent. On a subsequent frequency judgment task, pronunciation Ss failed to differ significantly from silent Ss on mean judgments of items presented only once; however, there were differences on these items as indexed by variance between and within Ss, as well as mean total correct. Further, an analysis of judgments on "zero" items (not seen on the study list) indicated differences between silent and pronunciation Ss on all four measures. These results were contrasted with previous findings, and explained within a frequency theory perspective.

Wilder, L., Levin, J. R., Kuskowski, M., & Ghatala, E. S. Pronunciation effects in verbal discrimination learning. Technical Report No. 279. 5.1.10.30.07.01.03. 7 pp. October 1973.

Previous research has found that spoken rehearsal is superior to silent rehearsal during verbal discrimination learning. Frequency theory can account for this finding as it is assumed that pronunciation leads to an even greater frequency differential between the randomly designated correct and incorrect item in each pair of words than occurs in silent performance. In two experiments in which an incidental recognition memory task was administered after verbal discrimination learning, support was found for this assumption. Further, in contrast with earlier research, it was found that the increased frequency differential was due at least as much to increased recognition of the previously correct verbal discrimination task items as to decreased recognition of the previously incorrect items.

Wilder, L., & Norton, R. W. The effects of pre- and post-choice verbalization instructions on discrimination learning in young children. Technical Report No. 229. 9 pp. August 1972. ED 073 481.

A total of 48 fifth grade and 30 nursery school Ss were administered picture pairs in a discrimination learning experiment. In addition to a control group, one group of Ss (pre-choice) was instructed to pronounce both items before choosing one, and another group (post-choice) was told to say both items after choosing one. The anticipation method was used, and the results indicated that there were not differences among the three conditions within either age group. The nature of the stimulus materials and the fact that control Ss pronounced their choice were discussed as possible factors contributing to the lack of differences.

Wilder, L., & Norton, R. W. Pronouncing as a method of choice in verbal discrimination learning. Technical Report No. 239. 9 pp. November 1972. ED 074 464.

Sixty college Ss were administered low frequency verbal discrimination lists under the conditions of pronouncing versus button pressing as a method of choice. Contrary to a recent finding with nursery school children, no significant differences in the two reponse modalities were detected.

Wilder, L., & Romaniuk, M. The motor component of speech in the verbal regulation of behavior. Technical Report No. 362. 5.1.10.30.07.01.01. 19 pp. December 1965. ED 127 644.

This paper reviews the Soviet theory of the development of verbal self-control in children. Three stages (impellent, supplementary speech, internal semantic connections) are described, and the role of the vocal, or speech, component is discussed as one of at least four types of supplementary speech training in the verbal regulation of behavior.

Two experiments are reported, utilizing nursery school, kindergarten, fifth grade, and college aged subjects. In the first experiment, four year olds and adults were administered a Vocal Alone, a Motor Alone, and a Combined reaction time task. In the second experiment, kindergarten and fifth grade subjects were administered a Double Motor, a Double Vocal and a Combined reaction time task.

The results suggest that when two overt responses are combined, the latency to the initial response is increased, but that there is nothing unique about the vocal response in this process. Further, it appears that by the age of four there is no developmental difference between the ability to combine two motor responses and the ability to combine a motor and vocal response.

Wiviott, S. P. Bases of classification of geometric concepts used by children of varying characteristics. Technical Report No. 143. (Ph.D. dissertation) 137 pp. August 1970. ED 046 049, Part 1; ED 046 050, Part 2.

The purpose of this experiment was to ascertain the relationship of grade level, achievement level, sex, and method of presentation to the various bases by which children classify geometric concepts. Two tasks were administered consecutively to subjects in the fifth, eighth, and eleventh grades. Task I consisted of the sequential presentation of an array of eight geometric concept cards. Half of the subjects had a verbal treatment and the other half a pictorial treatment. Task II consisted of a simultaneous presentation of a 26-item picture array of the same concepts. The subjects were asked to compare and group similar concepts; their responses were categorized according to three bases of classification: perceptible, attribute, and nominal. Results showed less use of the perceptible basis of classification with increase in grade level, with high achievers at all grade levels, and with those subjects who received verbal treatment for Task I.

Wolff, P. The role of stimulus-correlated activity in children's perception. Technical Report No. 223. 13 pp. April 1972. ED 070 025.

Two experiments examined the effect of haptic exploration on visual recognition of nonsense forms by 4 to 7 year old children. In

Experiment 1, haptic activity was optional for *S*. The amount and type of activity was rated. Those *Ss* who voluntarily produced haptic activity reached criterion in a repeated exposure-test recognition task in fewer trials than *Ss* who produced no activity. There was a tendency for the effect of haptic activity to decrease with age.

In Experiment 2, 4 year olds were trained in haptic exploration and then assigned to predetermined experimental conditions defined by the presence or absence of haptic activity. Again, visual recognition was enhanced by haptic exploration. These experiments are compared with previous studies which failed to demonstrate haptic facilitation of visual recognition, and possible explanations for haptic facilitation are discussed.

Wolff, P., & Levin, J. R. *The role of overt activity in children's imagery production*. Technical Report No. 204. 10 pp. January 1972. ED 066 229.

The role of motor activity in children's formation of dynamic mental imagery was investigated in two experiments using a paired-associate recognition task. From the recognition data it was inferred that (a) the child's ability to form dynamic images relating two objects undergoes its most rapid development between the ages of five and eight; and (b) the preimagery child can generate dynamic mental imagery in which two objects interact if he concurrently engages in overt manipulation of the objects. This is true even when the child has no visual access to his movements or to the objects being manipulated. These results offer strong support for Piaget's theoretical ideas concerning the role of overt and covert activity in the production of mental imagery.

Wolff, P., Levin, J. R., & Longobardi, E. T. *Motoric mediation in children's paired-associate learning: Effects of visual and tactual contact*. Technical Report No. 205. 9 pp. February 1972. ED 066 230.

This study examined the child's ability to generate memory-enhancing interactions between object pairs when either visual contact with the objects, tactual contact, or both were absent. The PA performance of each of these activity groups (Visual-Tactual, Visual-No Tactual, No Visual-Tactual, and No Visual-No Tactual) was compared with corresponding control groups which received imagery instructions, but had no opportunity to manipulate the object pairs. Rated quality of overt manipulation was lowered by the absence of tactual contact with the objects, but not by the absence of visual contact. Quality of manipulation was positively related to amount of facilitation of PA performance. These results support the involvement of overt activity in the young child's imagery production and learning, and also demonstrate the kindergarten child's inability to produce ongoing thematic activity when this activity is physically separated from the objects involved.

Wolff, P., Levin, J. R., & Longobardi, E. T. *Activity and children's learning*. Technical Report No. 258. 5.1.10.30.08.01.05. 7 pp. September 1973.

Using a yoked control procedure, kindergartners either produced or observed interactions between pairs of toys. When paired-associate recognition was tested immediately, no performer-observer differences were detected. After a 24-hour delay, however, the performers re-paired significantly more items than the observers. Intentional learning instructions did not change this result, indicating the centrality of motor involvement in children's learning.

Wolff, P., & Wilder, L. Visual and auditory memory in children. Technical Report No. 155. 11 pp. March 1971. ED 050 424.

Three studies investigated the effects of experience-produced labels on children's serial position memory. As in previous research with subject-produced labels, addition of the label facilitated performance only for the recency portion of the list. This effect did not vary systematically with age. Memory for the first serial position improved markedly between the ages of 5 1/2 and 6 1/2. Labels alone were superior to pictures at the end of the list, but pictures were superior to labels at the beginning. Combined picture and label presentation appeared to follow the curve for pictures at the beginning of the list and that for labels at the end. The results are discussed in terms of modality and mediation effects in children's short-term memory.

Yussen, S. R., Levin, J. R., DeRose, T. M., & Ghatala, E. S. Semantic versus physical processing in children's recall and clustering of pictures. Technical Report No. 312. 5.1.10.30.08.01.09. 11 pp. August 1974. ED 101 317.

This study was conducted to determine whether the recent semantic-physical processing distinction that Jenkins and his associates have invoked to account for differences in subjects' recall and clustering of verbal materials could be extended to include pictorial materials. In Experiment I, second grade children were exposed to 16 line drawings cross-classfied to represent four taxonomic categories and four shape categories, with four instances per category. Control subjects simply looked at pictures, Semantic subjects identified each picture's shape. In Experiment II, first graders freely sorted the pictures and were classified as Semantic or Physical processors based on their predominant bases for sorting. Following exposure (Experiment I) or sorting (Experiment II), all subjects were asked to recall the picture names. Results of both experiments show that semantic activity yields greater recall than physical activity. Experiment II also shows that semantic activity yields greater semantic clustering in recall and that physical activity yields greater physical clustering.

CONDITIONS OF SCHOOL LEARNING AND INSTRUCTIONAL STRATEGIES
5.1.20

Empirical Validation of the Instructional Programing Model

Instructional Variables in Concept Learning

Analysis of Peer Teaching Techniques

Analysis of Prereading Skills

Development of Reading Comprehension Skills

Development of Problem-Solving Strategies in Mathematics

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TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Abernatha, E., & Wiles, C. A. A three month trial of Developing Mathematical Processes with ten educable mentally retarded children. Technical Report No. 336. 5.1.20.50.01.01.05. 28 pp. May 1975.

The purpose of this study was to assess the usefulness of the elementary mathematics program Developing Mathematical Processes (DMP) for educable mentally retarded students. The subjects of this study were 10 children from an intact class who ranged in age from 7 to 12 years. The 1972

Developmental Edition of the DMP program was used in this trial, which encompasped the last three months of the 1973-74 school year.

Placement of students was guided by data from the program's placement inventories supplemented by teacher judgment. Selected topics and activities from Levels 1, 2, and 3 were used in the course of instruction. When a topic was completed, topic inventories were administered. This report contains teacher ratings of each topic and activity used as well as detailed summaries of all test data obtained.

The data attested to the appropriateness and effectiveness of the DMP materials for these subjects. The children showed a high level of interest and mastered the objectives of each topic with few exceptions. The teacher gave a positive evaluation of these materials, but cited inadequacies in the placement processes. In the teacher's opinion, the most important thing about the program was that it allowed students to experience success at their own pace and level.

Allen, V. L., & Boyanowsky, E. O. Generalization of independence produced by social support. Technical Report No. 109. 15 pp. December 1969. ED 039 618.

This study was conducted to determine whether independence produced by social support provided on one type of item in a group-pressure situation would generalize to a different item on which the subject was opposed by a consensual group.

Subjects were 180 female undergraduates who were tested in groups using a Crutchfield kind of apparatus. Results showed that social support, i.e., the presence of a partner answering immediately prior to the subject, significantly reduced conformity on both visual and opinion items.

Generalization of independence from social support to consensual group trials was not obtained.

Allen, V. L., & Bragg, B. W. Effect of group pressure on memory. Technical Report No. 30. 11 pp. September 1967. ED 016 600.

The effect of group pressure on the retention of previously learned material was investigated with a paired-associate task. Subjects received correct feedback, incorrect feedback, or no feedback, either from one person or from a group.

Allen, V. L., & Bragg, B. W. Effect of social pressure on concept identification. Technical Report No. 31. 9 pp. September 1967. ED 016 597.

Unanimous group feedback, correct or incorrect, was utilized to study the effect of feedback on concept identification and the transfer of its effect to a second concept identification problem.

Allen, V. L., & Bragg, B. W. Ordinal position and conformity. Technical Report No. 95. 9 pp. September 1969. ED 035 960.

The role-modeling theory was applied to the problem of birth-order and conformity to a same-sex peer group. Subjects were male and female college students from two-sibling families. The pattern of results for conformity was congruent with predictions made from role-modeling theory.

Allen, V. L., & Devin-Sheehan, L. The tutor as role model: Effects of imitation and liking on student tutors. Technical Report No. 304. 5.1.20.30.06.02.02. 26 pp. June 1974. ED 098 237.

The study investigated, within a role theoretical framework, the effect of different degrees of pupil imitation on male and female tutors' attitudes and behavior. Seventy-two sixth grade boys and girls tutored second graders of the same sex. A 3 x 2 x 2 factorial design was used (Pupil Imitation--Low, Medium and High; Pupil Liking--Medium and High; and Sex--Male and Female). An equal number of boys and girls were assigned randomly to each one of the six experimental conditions. The major finding was an interacting between Imitation and Sex: the greater the pupils' imitation of the tutors, the less the male tutors liked their pupils and the more the female tutors liked theirs (p less than .02). Implications for the cross-age relationships of students of different sexes and for elementary school tutoring programs are discussed.

Allen, V. L., & Feldman, R. S. Learning through tutoring: Low-achieving children as tutors. Technical Report No. 236. 9 pp. September 1972. ED 070 026.

Low-achieving fifth grade children either taught a third grader or studied alone for a series of daily sessions. At the end of the two-week period, the low-achievers' performance was significantly better in the tutoring condition than in the studying alone condition--a reversal in direction of the initial difference between conditions. There was no differential effect on tutees of being taught versus studying alone. Results suggest that serving as a tutor may be a particularly useful method for enhancing the academic performance of low-achieving children.

Allen, V. L., & Feldman, R. S. Decoding of children's nonverbal responses. Technical Report No. 365. 5.1.20.30.08.01.03. 15 pp. October 1975. ED 117 044.

This experiment was designed to investigate the ability of children and adults to decode nonverbal responses from other children. Adults, third graders, and sixth graders observed third graders on videotape who were listening either to a difficult or an easy lesson. The observers judged how much each stimulus person understood on the basis of nonverbal cues contained in the presentation.

Results showed children to be more accurate than adults on this decoding task. Third and sixth grade children significantly differentiated between stimulus persons who were listening to easy and difficult lessons, but adults did not. There were significant differences also among stimulus persons in the degree to which their cognitive state was accurately decoded by observers. The results of this experiment have clear implications for classroom teaching and for tutoring by children.

Allen, V. L., & Levine, J. M. *Creativity and conformity*. Technical Report No. 33. 11 pp. November 1967. ED 019 747.

Conformity in group pressure was compared for 76 fifth grade *S*s who received creativity training and for 88 matched controls.

Allen, V. L., & Levine, J. M. *Consensus and conformity*. Technical Report No. 41. 11 pp. January 1968. ED 020 552.

Two methods of breaking group consensus were employed in this study, and the effects on the responses of college subjects to both objective and subjective stimuli were measured. The results suggest the need for modification of existing theories of conformity behavior. In addition these results emphasize the differences in conformity of males and females.

Allen, V. L., & Levine, J. M. *Social support and conformity: The effect of differentiation from the group and order of responding*. Technical Report No. 72. 8 pp. January 1969. ED 064 658.

This study is directed toward identification of the effects of peer group pressures on the utilization of concepts already learned and on the learning of new concepts. In the experiment reported two variables relevant to explaining the social support phenomenon were investigated. Possible mechanisms underlying the position and contact effects are discussed.

Allen, V. L., & Levine, J. M. *Social support and conformity: The role of independent assessment of reality*. Technical Report No. 83. 11 pp. April 1969. ED 035 955.

This study investigated the role of one factor in the dramatic conformity reduction produced by a partner who agrees with *S* in the face of group pressure. The independent assessment of social and physical reality provided by the partner is crucial to the efficacy of social support in reducing conformity.

Allen, V. L., & Newtson, D. *Conformity, anticonformity, and independence*. Technical Report No. 88. 21 pp. June 1969. ED 035 951.

The present studies tested the hypothesis that a social supporter with negative task-related characteristics would be less effective in reducing conformity in a group pressure situation than a social supporter without such negative characteristics. The hypothesis was tested in a standard Crutchfield simulated group.

Allen, V. L., & Newtson, D. *The development of conformity and independence*. Technical Report No. 164. 19 pp. April 1971. ED 051 537.

Age trends in conformity and independence were investigated in an Asch kind of conformity situation with 366 children from the first, fourth, seventh, and tenth grades. Unanimous peer pressure was found to yield decreasing conformity with age, being more pronounced for males than for females. Adult influence declined with age for both sexes. Social support from a partner who gave correct or modal answers reduced conformity to a constant low level across all ages. It was concluded that mechanisms of group influence are highly similar across age, and that age trends may reflect variations in situational factors associated with age differences.

Anglin, L. W., Jr. The school organization and curriculum-instruction decision-making. Technical Report No. 398. (Ph.D. dissertation) 5.1.20.20.10.02.01. 170 pp. September 1976.

The purpose of the study was to conceptualize the teacher's curriculum-instruction (C-I) decision-making role in various school organizational structures. An organizational perspective was used which related the curriculum-instruction management role of the classroom teacher to the school organization within which the teacher functions. Four generalized school organizational types (the traditional, the academy, the system, and the clinical) were identified which incorporate unique decision-making tasks, and consequently, unique C-I management roles for teachers.

In the traditional school organizational type, in which it is assumed that the nature of instruction is well understood and children are uniform, the C-I management role of the teacher was shown to be specific and non-creative. Conversely, in the clinical school organizational type, in which it is assumed that the nature of instruction is not well understood and children are not uniform, it was shown that the teacher is expected to be involved in all instructional decision making.

The academy and system school organizational types were shown to have unique C-I management task structures which reflect a combination of characteristics present in both the traditional and clinical school organizational types.

Arganian, M. P., Frayer, D. A., Goldman, J. A., Lubin, S. K., & Storck, P. A. Acquisition of the concept "biodegradable" through written instruction: Pretest and age effects. Technical Report No. 226. 35 pp. June 1972. ED 073 940.

The purpose of this experiment was to determine whether children in the middle elementary grades would be able to learn the concepts biodegradable agent, biodegradable material, and biodegradable process from a short written lesson. In addition, the experiment was designed to explore the effects of pretesting, grade level, and sex of student on the amount learned.

The basic design was a Solomon Four-Group Design with pretest and lesson as factors. The design was replicated at two grade levels, fourth and sixth. Sex of student was also included as a factor in the design.

Both fourth and sixth grade students gained information concerning the concepts biodegradable agent, biodegradable material, and biodegradable process by studying a short written lesson, and retained a significant amount of that information for a three-month period. Sixth graders had greater prior knowledge concerning the concepts than fourth graders, and also learned more from the lesson. Administration of a pretest prior to studying the lesson did not affect the amount learned. Boys did not differ from girls either in background knowledge or amount learned.

Askov, E. N. Assessment of a system for individualizing reading instruction. Technical Report No. 117. (Ph.D. dissertation) 87 pp. March 1970. ED 040 840.

This study was designed to assess the effects of using the Wisconsin Prototypic System of Reading Skill Development, an experimental program which emphasizes diagnosis of reading skill development and instruction geared to individual skill needs. Pupil attitudes toward recreational reading were compared considering grade and achievement level. Those areas most directly affected by the experimental treatment showed change--i.e., teachers' classroom procedures and attitudes toward individualized reading instruction.

Askov, E. N. Assessment of attitudes toward reading in primary pupils. Technical Report No. 206. 25 pp. January 1972. ED 070 068.

The rationale for the development of the Primary Pupil Reading Attitude Inventory is presented. The process of developing, using, and subsequently revising the instrument is described. Findings from additional studies are then presented to provide further information about subtest and item characteristics of the instrument.

Barganz, R. A. The morphophonemic performance of good and poor readers. Technical Report No. 182. (Ph.D. dissertation) 144 pp. November 1971. ED 070 064.

The primary purpose of this study was to investigate the ability of good and poor readers in grade five to recognize the form of derived words where morphophonemic alternation occurs but orthographic consistency exists. Drawing primarily upon the theoretical frameworks of Chomsky and Halle, Venezky, and MacDonald, the study focused upon the psychological validity of phonological and reading competence models.

A pattern was revealed suggesting that good readers can more ably recognize the underlying forms of words than poor readers. When surface structures are related these differences between good and poor readers diminish.

Bernard, M. E. The effects of advance organizers and within-test questions on the learning of a taxonomy of concepts. Technical Report No. 357. 5.1.20.25.01.01.07. 267 pp. December 1975. ED 120 625.

The present study investiated the effects of a group of single-concept instructional variables on the learning of a taxonomy of behavior management concepts. The effects of presenting advance organizers and inserting within-text questions were also examined. The influence of the single-concept instructional variables, advance organizers, and within-text questions on the understanding of supraordinate-coordinatesubordinate relationships among the concepts within the taxonomy and in the recognition of the position of each concept within the taxonomy was also investigated.

Single concept instructional variables resulted in a significant amount of learning across the three assessment measures in comparison with a condition of no instuction.

Bernard, M. E. *Task analysis in instructional program development*. Theoretical Paper No. 52. 5.1.20.25.01.01.06. 31 pp. May 1975. ED 114 735.

A review of task analysis procedures beginning with the military training and systems development approach and covering the more recent work of Gagne, Klausmeier, Merrill, Resnick, and others is presented along with a plan for effective instruction based on the review of task analysis.

Literature dealing with the use of task analysis in programmed instruction designed to teach concepts and principles is summarized. Topics relating to instructional objectives and the organization of subject-matter knowledge, learning hierarchies, hierarchical dependency in cognitive development, and instructional analysis and sequencing are examined from a task analysis perspective. Research recommendations and critique are provided.

Bingham-Newman, A. M., Saunders, R. A., & Hooper, F. H. *Logical operations instruction in the preschool*. Technical Report No. 354. 5.1.20.22.01.01.03. 182 pp. in 2 parts. April 1976.

The study was designed to develop, implement, and evaluate an experimental preschool education program based on Piaget's theory of cognitive development, and to examine Piaget's theoretical assumptions and postulated cognitive developmental trends for a 2-year period of the preoperational substage. Aspects of cross-sectional and longitudinal designs were incorporated into the pretesting and posttesting of two overlapping waves of experimental and control group populations of preschool children over a period of 3 years.

The subjects were evaluated with two standardized measures (Peabody Picture Vocabulary Test and RAVEN Coloured Progressive Matrices) and a representative battery of 8 Piagetian tasks. The differences in developmental patterns between the experimental and control groups were examined with tasks of seriation, classification, transitivity, conservation, measurement, class inclusion, and with two matrix tasks (double seriation and cross-classification).

Although Piagetian theory provided a very workable and stimulating foundation for a preschool curriculum, program effects in this research were greatly overshadowed by the large amount of individual variation in the rate and sequence of cognitive developmental acquisitions in the preoperational stage.

Brumet, M. E. Applying Bayesian statistics to educational evaluation. Theoretical Paper No. 62. 5.1.20.21.02.01.04.03. 23 pp. May 1976.

An alternative approach known as Bayesian statistical inference which is unfamiliar to many educational evaluators is effective for decision making in that it defines probability as a measure of opinion or belief, rather than as long-term frequency, and enables the Bayesian investigator to consider a wider range of information than is possible with the traditional model. Personal expertise, logical analysis, and soft data from a wide variety of sources serve to shape opinion about a state of nature, with experimental data providing additional information either for or against the prior opinion of the evaluator. In classical statistics, prior knowledge or opinion is ignored. However, when practical decisions must be made the Bayesian stresses that all knowledge should be brought to bear on the problem rather than just an isolated set of data. Because of the decision-making orientation of the evaluator, the Bayesian model should be considered as an alternative to classical inference.

The questions raised by the Bayesian model are useful even if the model is not totally adopted.

Burke-Merkle, A., & Hooper, F. H. Logical task performances in the preschool: The effects of classification and seriation instruction. Technical Report No. 270. 5.1.20.10.01.02.02. 16 pp. September 1973.

The efficacy of small group instructional programs in classificatory, seriation, and combined class/series skills was evaluated for a sample of 60 urban, middle-class, 4 to 5 year old children in a transfer of training design. Significant curriculum specific transfer effects were found for the seriation instructional condition, whereas little differences were found for the classification, verbal intelligence, and far transfer conservation task measures. Sex differences, school location effects, teachers biases, and pretesting effects were generally absent. The apparent feasibility of seriation skill instruction for preschool-aged children and the general noneffectiveness of the classificatory and combined instructional conditions, particularly insofar as far transfer effects are concerned, suggest a nonunitary picture of cognitive functioning during the transitionary phases between preoperational and concrete period thought.

Burmeister, L. E. An evaluation of the inductive and deductive group approaches to teaching selected word analysis generalizations to disabled readers in eighth and ninth grades. Technical Report No. 12. (Ph.D. dissertation) (Out of print) 41 pp. November 1966. ED 010 514.

Following the identification of generalizations at approximately a 90 percent utility level applying to words above the primary level in difficulty, two-week instructional plans prepared by the author were used in teaching. Scores on both oral and silent posttests were analyzed.

Buchanan, A. E., Hansen, P. J., & Quilling, M. R. Effects of increased home-school contact on performance and attitude in mathematics. Technical Report No. 89. 5 pp. June 1969. ED 036 446.

The purpose of this experiment was to study the influence of increased home-school contact on children's performance and attitudes in mathematics. Both the single and combined effects of frequent parent-teacher conferences and of homework were studied.

Butts, P., & Sanders, J. Motivated Reading: A supervisor's manual for a tutorial reading program. Practical Paper No. 12 in 2 parts. 43 pp. September 1972. Part 1: ED 073 445; Part 2: ED 073 446.

The manual presents information on how to conduct a tutorial reading program that features a plan for motivating students. The program is intended for upper elementary and junior high school students who read approximately on a second or third grade level. The program can serve especially those students with behavioral difficulties that hinder learning; a motivational system reinforces the performance of such students and sustains their effort in learning over long periods.

The basis for this program is an instructional design, the Staats "Motivated Learning" Reading Procedure, developed through research by A. W. Staats. The manual indicates how the original procedures have been adapted for use with some commercial reading materials. Included is a description of the adapted programs occurring in the Milwaukee Public Schools during three years.

Part 1 presents information on operating the program. This includes how to arrange instructional schedules, prepare materials, select students, select and train tutors, and supervise the program while in progress. Part 2 provides the supervisor's materials and a tutor's guide.

Calfee, R. C. Short-term retention in normal and retarded children as a function of memory load and list structure. Technical Report No. 75. 25 pp. February 1969. ED 031 831.

Studies of recall and recognition short-term memory (STM) were reviewed and a series of studies of serial recognition memory of normal and retarded children was described. From experiments using a recall procedure it was concluded that important variables affecting adult performance also had comparable effects on normal and retarded children. Except for response biases and forgetting rate, recognition memory processes of normal and retarded children appeared to be identical to those of adults.

Calfee, R. C. The role of mathematical models in optimizing instruction. Theoretical Paper No. 17. 27 pp. March 1969. Out of print. ED 039 102.

With the advent of computers in the classroom, the decision structure implicit in the teaching process has been obvious. Given a descriptive model of the learning process, it is in some cases possible to derive optimal conditions for instruction.

Calfee, R. C., & Jameson, P. Visual search and reading. Technical Report No. 157. 10 pp. March 1971. ED 050 924.

Subjects were asked to look for occurrences of words from a target list while reading a passage for comprehension. In Experiment I, Ss searched for the specific words in the target list, in Experiment II for any close associate of words in the target list. Reading speed was affected only by the number of words in the target list. Neither the number of target words nor the number of occurrences had any effect on comprehension. The results indicate that central memory load limits reading speed, but that scanning and decoding processes are so automated that they are unaffected by the additional tallying operation in this task.

Calfee, R. C., Venezky, R. L., & Chapman, R. S. Pronunciation of synthetic words with predictable and unpredictable letter-sound correspondences. Technical Report No. 71. 15 pp. February 1969. ED 066 736.

A list of synthetic words was prepared for testing the pronunciation of predictable patterns, unpredictable patterns, and miscellaneous spellings. Participating in the study were third and sixth graders from two elementary schools, eleventh graders, and college students.

Carpenter, T. P. The role of equivalence and order relations in the development and coordination of the concepts of unit size and number of units in selected conservation type measurement problems. Technical Report No. 178. (Ph.D. dissertation) 141 pp. August 1971. ED 058 324.

This study was designed to investigate the development of certain measurement concepts, to relate this development to the development of conservation, and to determine the role of equivalence and nonequivalence relations in conservation and measurement problems. Subjects were children in grades K-2.

The results indicate that: (1) There is no significant difference in difficulty between conservation and measurement problems due to different combinations of equivalence and nonequivalence relations. (2) Measurement processes are meaningful to most first and second grade students and can be used to compare quantities; however, a significant number of young children readily abandon measurement choices if they are followed by conflicting visual cues; and the majority of first and second grade students do not recognize the importance of a constant unit of measure and incorrectly apply measurement processes that involve more than one unit of measure. (3) Numerical conflict produced by measuring with different units of measure results in the same degree of errors as the visual conflict produced by pouring liquids into different-shaped containers in the classical conservation problems. (4) Most conservation and measurement errors result from children centering on an immediate dominant dimension; consequently, problems in which the correct cues appear last are significantly easier than problems in which they are followed by distracting cues. Order, however, is not the only significant variable. Problems in which correct cues are numerical are significantly easier than similar problems in which correct cues are visual.

Carpenter, T. P. The performance of first grade students on a nonstandard set of measurement tasks. Technical Report No. 211. 19 pp. December 1971. ED 070 662.

This study was designed to examine first grade students´ understanding of several basic measurement processes. Twenty Ss randomly selected from five first grade classes in two schools were individually examined on eleven measurement tasks. Seven of the tasks were adapted from items reported in the Gal´perin and L. S. Georgiev study designed to test young children´s understanding of the unit of measure. Four additional tasks were patterned after the Soviet problems except that Ss had to respond strictly on the basis of numerical cues with no physical evidence present.

Ss generally had difficulty with the tasks. However, these difficulties did not appear to stem from an incorrect characterization of the unit of measure as hypothesized by Gal´perin and Georgiev. They seemed to be more the result of Ss´ inability to conserve, their inexperience with the specific measurement operations, and an ambiguity in several of the items.

More specifically, the study showed that Ss did not have a stable concept of measurement, nor were they able to appreciate the value of a constant unit of measure. There was little transfer between measurement tasks. Measurement tasks involving unequal quantities were easier than similar tasks involving equal quantities. Moreover, Ss readily shifted bases of comparison of quantities, even on the same task. And finally, the study showed that numerical cues were almost as strong as physical cues in certain conservation tasks.

Carvell, R. L. Reading comprehension and regularized orthography. Technical Report No. 364. (Ph.D. dissertation) 5.1.20.40.03.01.04. 163 pp. December 1975. ED 116 165.

The purpose of this study was to compare mature readers´ comprehension of text presented in traditional orthography with those same readers´ comprehension of text presented in a regularized orthography. Two considerations were of particular concern in the study: (1) When traditional orthography is regularized, is any loss of meaning attributable to the loss of the visual dissimilarity of homophones? (2) When traditional orthography is regularized, is any loss of meaning attributable to the loss of visual similarity in morphemes?

All subjects were administered a pretest in traditional English spelling. Two weeks after pretesting, two groups of subjects received four days of instruction and practice in the principles of a regularized orthography. The remaining two groups received instruction typical of that received by twelfth grade English students. For the posttest, two groups received forms of the tests with the text presented in traditional orthography and two groups received forms of the test with the text presented in a regularized orthography.

Posttest scores on the test forms of the comprehension test presented in a regularized orthograpphy were significantly lower than the posttest scores on the test forms of the comprehension test presented in traditional orthography.

The tentative conclusions drawn were that the loss of the visual dissimilarity of homophones was not a factor affecting comprehension but that the loss of visual similarity in morphemes related in meaning had a negative effect on the establishment of meaning relationships between such morphemes.

Chapman, R. S., & Kamm, M. R. An evaluation of methods for teaching initial sound isolation. Technical Report No. 212. 9 pp. February 1972. ED 066 231.

The ability to analyze a word into its component sounds is prerequisite to a child's learning of letter-sound correspondences and therefore to his learning to read. As prereaders do not typically master the ability to analyze a word into its component sounds, techniques must be developed to teach them this skill. Most procedures which have been tried have not been successful with children younger than 6 or 7 years; however, Zhurova reports success teaching even 3 year olds to isolate initial sounds of words with the method she describes. The current experiment evaluated Zhurova's iteration method of instruction by comparing it with a segmentation method. Ss were 32 kindergartners. The two methods of instruction were fully crossed with four sequences of real-word and nonsense-stimulus items, given in two training sessions. None of the six variables was significant; however, training time had a significant effect.

Chapman, R. S., & Ting, A. C. The consistency of articulation errors in young children. Technical Report No. 153. 11 pp. March 1971. ED 050 926.

Forty normal children aged 3-1/2 to 5-1/2 were tested on the pronunciation of initial /-l/, /-r/, and /s-/ clusters in 120 words. The phonemes /l/, /r/, and /s/ occurred 36, 48, and 42 times, respectively; other phonemes in the cluster occurred from 6 to 18 times. Articulation errors of individual Ss were examined for evidence of degree and type of consistency, including consistency in rate of error; the articulatory feature changed in substitution errors, regardless of phoneme; and the error made on a phoneme.

It was found that children typically made the same number of errors when retested on similar lists, but not on the same items. There was little evidence for consistency in making errors on particular phonemes or features. Few children mispronounced any phoneme more than 50 percent of the time; indeed, most missed a phoneme in initial or final position in a cluster only once. In the few instances in which children made more than one error on a phoneme, however, the error made was usually the same; that is, Ss were consistent in the error made.

The implications of these findings for test construction and clinical work with speech-defective children are discussed.

Chapman, R. S., & Ting, A. C. The effect of mode of elicitation in articulation testing. Technical Report No. 154. 11 pp. March 1971. ED 050 925.

Differences in articulation error rates and error patterns were examined as a function of five elicitation modes: picture, picture with pretraining, word repetition, sentence repetition, and nonsense word repetition. The same 15 words (or pictures representing them) were used as stimuli in the four real-word conditions; nonsense words were formed by recombining the vowels and final consonants of the real words.

Subjects were 22 preschoolers, 8 kindergartners, 10 first graders, and 24 college students. Each S was tested in each mode with order of testing counterbalanced. Errors in initial consonants, initial consonant clusters, vowels, final consonants, and final consonant clusters were scored separately.

Error rates and error patterns were similar for the four real-word modes. The nonsense words showed an error rate three times higher than that of the real-word modes and, in contrast with the real-word modes, increased rather than decreased from initial to final position.

The effect of test items which are effectively nonsense is discussed for normative and correlative studies. Additional considerations bearing on the choice of real-word testing modes are presented.

Chester, R. Prereading/Word Attack fit study. Technical Report No. 342. 5.1.20.40.01.01.03. 9 pp. March 1975.

This study was initiated both to follow up an earlier investigation and to gather additional descriptive data regarding the relationship between the Prereading Skills Program and the Word Attack area of the Wisconsin Design. Four Wisconsin schools participated. In this study, kindergarten students who had completed one year of instruction in the Prereading Skills Program were tested on six Level A and two Level B Wisconsin Design Word Attack skills. Test results indicated that students mastering all Prereading skills could not be considered masters of Level A Word Attack skills. Students who mastered the three Prereading visual skills mastered the Wisconsin Design Word Attack visual skills about 90 percent of the time; however, students who mastered the Prereading sound skills mastered the Design sound skills only about 65 percent of the time.

Chester, R. The Word Attack component of the Wisconsin Design for Reading Skill Development: Three empirical studies on skill mastery, skill retention, and the effects of incentive treatments for teachers. Technical Report No. 333. 5.1.20.40.01.02.01. 23 pp. July 1975. ED 113 697.

This report summarizes information regarding populations, methods, evaluation and instructional materials, analyses, and results from three doctoral dissertations that used the Word Attack component of the Wisconsin Design for Reading Skill Development as an instructional and assessment instrument. Study 1 investigated the assumption that mastery of essential word attack subskills results in functional word attack ability. In addition, the study examined differences in ability to decode phonically and structurally irregular words between students who had received instruction in the Word Attack component of the Wisconsin Design and students who had not received such instruction. Study 2 investigated the degree to which first grade subjects retained reading ability over summer vacation. Reading ability was measured by both norm-referenced and criterion-referenced tests. Study 3 investigated the effects on selected teachers of three motivational treatments: (1) pupil reading achievement monitored without feedback to teachers, (2) social incentives given to teachers, and (3) monetary incentives given to teachers. Measures of effect were gain scores on the *Wisconsin Tests of Reading Skill Development: Word Attack* and staff teachers' perceptions of selected interpersonal variables.

Cicirelli, V. G. *Concept learning of young children as a function of sibling relationships to the teacher*. Technical Report No. 175. 46 pp. October 1971. ED 057 399.

This study of the attainment of the trapezoid concept by first grade children when taught by third grade children attempted to answer the question: Is a sibling relationship associated with concept learning of a younger child taught by an older child? Each of the 120 first grade children in the study had an older sibling in third grade; equal samples of 30 sibling pairs were drawn from the population of boys with older sisters, boys with older brothers, girls with older sisters, and girls with older brothers. For half of these children, the older sib served as the teacher of his or her younger sib; the remaining half were re-paired so that the older child taught an unrelated first grade child. Once the older child was trained in the concept, he taught it to the younger child in a ten-minute session. It was found that male learners scored higher on the trapezoid concept attainment test than female learners; learners scored higher when they were taught by a female sib than when they were taught by a male sib or a female nonsib. Girls teaching their sibs used a deductive teaching method more than other groups. Learners with higher concept attainment scores also showed greater awareness of the relevant attributes of the concept. Results can be interpreted in terms of role theory and sibling rivalry and have implications for the selection of older children for use in school tutoring programs.

Davidson, N. A. *The small group-discovery method of mathematics instruction as applied in calculus*. Technical Report No. 168. (Ph.D. dissertation) Out of print. 375 pp. October 1971.

This paper reports the development of a new strategy of mathematics instruction in which students work together in small groups to discover mathematical results. The strategy is named the "small group-discovery method." To determine the feasibility of the method, a one-year pilot study was conducted with a class of college freshmen studying calculus.

On a comparative final examination, the students in the pilot class scored slightly but not significantly better than the students in a control section taught by the lecture-discussion system. The students in the discovery class performed very credibly on seven take-home examinations. An open-ended questionnaire showed that the pilot class had either positive or non-negative effects upon each student's interest in mathematics and estimate of his problem-solving skill. The study indicated that the small group-discovery method deserves intensive investigation as an approach for instruction and curriculum development, and a number of problems were stated for further investigation.

DeRose, T. M. The effects of verbally and pictorially induced and imposed strategies on children's memory for text. Technical Report No. 394. (Ph.D. dissertation) 5.1.20.42.01.01.07. 150 pp. August 1976.

This study was an attempt to extend the results of research in which subject-generated and experimenter-provided verbal and pictorial elaboration has been shown to facilitate paired-associate learning, as well as investigations of the differential facilitation due to reader differences of elaboration strategies on memory for text.

In addition to the interest in the effects due to treatments, it was also expected that there would be an interaction between treatment and ability: The low ability group would benefit more from provided illustrations than would the high ability group. This was not found to be the case. In fact, both groups benefited from illustrations by about the same amount compared to the Control.

Directions for future research are discussed in terms of employing different types of passages, more disparate groups of subjects, different forms of elaboration, and other individual differences dimensions.

Fang, M. C. S. Effect of incentive and complexity on performance of students from two social class backgrounds on a concept identification task. Technical Report No. 10. (Master's thesis) 24 pp. September 1966. ED 010 512.

This study extended the use of materials previously used with subjects of two socioeconomic levels. Concept identification problems of three levels of complexity were solved under three incentive conditions.

Feldman, K. V. Instructional factors relating to children's principle learning. Technical Report No. 309. (Ph.D. dissertation) 5.1.20.25.01.01.12. 267 pp. August 1974.

This study investigated the effect of two external conditions on the learning of principles by children: (1) instruction on the major concepts related in the principle and (2) the number of teaching examples (correct applications) and teaching nonexamples (incorrect applications) of the principle presented with a statement of the principle. Two principles, one designated as "easy" and one as "difficult," from each of two subject matters, mathematics and language arts, served as the content of the learning task.

In general a rationally selected set of examples and nonexamples was found to be more facilitative than one example. Main effects for instruction on concepts related in the principles were not found to be significant; the conditions associated with this unanticipated result were discussed.

Feldman, K. V., & Klausmeier, H. J. The effects of two kinds of definition on the concept attainment of fourth and eighth grade students. Technical Report No. 261. 5.1.20.25.01.01.02. 9 pp. August 1973. ED 085 684.

To determine the effect of the amount and type of information supplied by a concept definition, fourth and eighth graders were presented with one of two definitions: a "technical" definition which precisely specified all defining attributes of the concept, and a "common usage" definition from a children's dictionary which did not specify all defining attributes. Fourth graders were found to perform significantly better on a classification task with the common usage definition than with the technical definition, while eighth graders performed better with the technical than the common usage. It was concluded that for younger students it is more important to provide a definition written at an appropriate level than a definition which completely specifies the concept's defining attributes.

Feldman, K. V., Schilling, J. M., & Klausmeier, H. J. Lessons designed to teach fifth grade students the concept "tree" at the formal level of attainment. Practical Paper No. 15. 5.1.20.25.02.01.02. 66 pp. June 1975. ED 114 289.

These lessons were developed for use in a study with fifth grade students to determine whether or not the children's concept learning could be accelerated. The instructional strategies used in the lessons had been shown in previous studies to facilitate concept learning when used either singly or in combination: use of a definition, empirical selection of concept examples through an instance probability analysis, use of rational sets of examples and nonexamples, pairing of examples with nonexamples, emphasis of relevant attributes, teaching strategy, immediate feedback, and active involvement by the student.

The lessons were designed to teach the concept tree to the formal level of concept attainment as specified in the model of conceptual learning and development. The first lesson (TR 1) presents the defining attributes of the concept tree and teaches the children labels for them. The second lesson (TR II) presents the definition of tree, presents a rational set of examples and nonexamples of the concept, and teaches a strategy for distinguishing between them.

Feldman, R. S. Nonverbal disclosure of deception and interpersonal affect. Technical Report No. 343. 5.1.20.30.08.01.06. 22 pp. April 1975. ED 073 942.

The present study explored the effect of lying on nonverbal behavior. Subjects were 146 females who were instructed either to lie or tell the truth to a confederate. The underlying affective state of the subjects and the publicness of the interaction between subject and confederate were also varied experimentally. The nonverbal behavior of the subjets was analyzed using objective scoring by trained coders and by showing samples of subjects' behavior to naive judges who rated how pleased the subjects appeared. Results showed that nonverbal behavior tended to reflect whether a subject was dissembling or telling the truth. In addition, when they were truthful, subjects revealed their underlying affective states. However, when lying, there was no difference in nonverbal behavior according to the affect felt for the confederate. The nonverbal behavior of the subjects also tended to differ according to whether they were interacting publicly or privately; in public, subjects appeared more pleased with the confederate than in private.

Feldman, R. S., & Allen, V. L. Four studies on attribution of ability. Technical Report No. 281. 5.1.20.30.06.03.01. 43 pp. January 1974.

Study I--In single tutoring sessions, sixth grade tutors taught a concept-formation task to third grade tutees. Performance of the tutees was controlled to create differential patterns of success and failure on the two parts of the task: success-success, failure-failure, success-failure, and failure-success. It was expected that the condition most closely approximating the role of good teacher (failure-success) would result in more positive reactions by the tutor. Results showed that the sequence of tutee performance exerted a strong impact on the tutor's attributions of ability and affective responses concerning the tutee. A strong primacy effect emerged: the tutee's initial performance had a stronger impact on the tutor's reaction than later performance. Differential performance by the tutee did not affect the tutor's evaluation of his own teaching ability.

Study II--Ss observed a filmed tutoring lesson in which the tutee displayed one of four sequences of learning on the two parts of the lesson: success-success, failure-failure, failure-success, or success-failure. Ss were told either that the second part of the lesson had occurred immediately after the first or that it had occurred two days after the first. Results showed a primacy effect in ability attributions: an S's attribution was determined by the tutee's performance on the first part of the lesson regardless of his second-part behavior. There were no differential effects produced by separating the lesson parts.

Study III--The primacy effect in attribution of ability was explored. Ss observed a tutoring session in which a student displayed one of four sequences of learning on the two parts of the lesson: success-success, failure-failure, failure-success, or success-failure. In an attempt to eliminate the primacy effect, the lesson in some conditions was structured as two discrete units temporally. Elementary school Ss either viewed the second part of the lesson immediately after the first part or observed it two days after the first. Separating parts of the lesson did not eliminate the primacy effect: early performance had a greater effect on attribution of ability than later performance. Recall results did not support the theory that the primacy effect is due to the assimilation of later performance to initial expectation.

Study IV--Two experiments investigated observers' attribution of ability based on a student's performance. Ss viewed a graphical representation of one of four patterns of alleged performance on the two parts of a concept-formation task: success-success, failure-failure, success-failure, or failure-success. In contrast to the typical finding of a primacy effect in ability attribution, results of both experiments showed a strong recency effect: the student's performance on the second half of the learning task was the major determinant of attribution of ability.

Feldman, R. S., & Allen, V. L. Effect of tutee performance on tutor's verbal and nonverbal behavior. Technical Report No. 305. 5.1.20.30.06.02.01. 15 pp. March 1974. ED 102 120.

The verbal and nonverbal behavior of sixth grade children tutoring third grade children was analyzed. Results showed that when the student was doing well there was a greater proportion of positively toned affective statements made by the tutor, and when the student was doing poorly there were more negatively toned affective statements. Likewise, the nonverbal behavior of tutors tended to reflect the performance of the student. The relationship between verbal and nonverbal behavior was examined.

Feldman, R. S., Towson, S. M., & Allen, V. L. Two field studies on cross-age tutoring in the school. Technical Report No. 361. 5.1.20.30.06.02.03. 24 pp. November 1975. ED 117 045.

Two studies investigated the effect of peer teaching on the attitudes and behavior of tutors and tutees. The studies were designed to compare two approaches to tutoring: emphasis on information transmission or on the affective relationship between tutor and tutee. In Experiment I third grade students were taught by fourth graders for two weeks. Experiment II used first graders taught by fifth graders for six weeks. In both experiments a "friendship" control condition was used, in which an older child interacted with a younger child, but did not teach. Subjects in the short-term experiment enjoyed the program, but results disclosed little difference between the experimental and control conditions. The younger children did, however, learn the material taught by their tutors. In the second experiment the learners also experienced objective gains in learning the material. The young children being taught differed from the control subjects on items involving judgments of intellectual and school-related competence.

Fennema, E. H. A study of the relative effectiveness of a meaningful concrete and a meaningful symbolic model in learning a selected mathematical principle. Technical Report No. 101. (Ph.D. dissertation) 192 pp. July 1969. ED 036 444.

The results of this study indicate that there were no significant differences in the overall learning of a mathematical principle when learning was facilitated by a meaningful concrete or a meaningful symbolic model. Second grade children were able to learn a mathematical principle by using only a symbolic or a concrete model when that model was related to knowledge the children had. This provides evidence that making the teaching of mathematical principles meaningful is as important as the materials used to demonstrate that principle.

Frayer, D. A. *Effects of number of instances and emphasis of relevant attribute values on mastery of geometric concepts by fourth and sixth grade children*. Technical Report No. 116. (Ph.D. dissertation) 112 pp. in 2 parts. March 1970. ED 040 878.

The object of this study was to determine the effect of the number of instances and the emphasis of relevant attribute values on the level of concept mastery.

Eight versions of programmed lessons dealing with geometric concepts were prepared in which the independent variables of number of instances (4 or 8) and emphasis of relevant attribute values (presence or absence of attention-directing and review questions) were varied systematically.

Frayer, D. A., & Klausmeier, H. J. *Variables in concept learning: Task variables*. Theoretical Paper No. 28. 37 pp. September 1971. ED 057 402.

This paper focuses on task variables. Research dealing with instructions, temporal factors, and feedback is critically reviewed and synthesized. Variables related to each of these factors are identified and generalizations are drawn concerning their effects. Implications of these generalizations for a model of cognitive operations and for educational practice are also presented.

Fredrick, W. C. *The effects of instructions, concept complexity, method of presentation, and order of concepts upon a concept attainment task*. Technical Report No. 3. (Master's thesis) Out of print. 26 pp. November 1965. ED 010 203.

In the concept attainment experience described, sex of the subject, number of relevant and irrelevant attributes, type of instruction, and order of concepts were analyzed as independent variables. Several measures of transfer were obtained.

Fredrick, W. C., Golub, L. S., & Johnson, S. L. *Analysis of the "Linguistic Ability Test," Grades 4 & 6*. Technical Report No. 121. Out of print. 35 pp. March 1970. ED 040 401.

The Linguistic Ability Test was designed, pilot tested, revised, and field tested in an attempt to measure the skills implied by psycholinguistic ability. The future importance of the LAT is projected, and the test, along with its planned revisions, is included in the report.

Gaa, J. P. *Goal-setting behavior, achievement in reading, and attitude toward reading associated with individual goal-setting conferences*. Technical Report No. 142. (Ph.D. dissertation) 151 pp. September 1970. ED 047 920, Part 1; ED 047 921, Part 2.

The study was designed to investigate the effects of individual goal-setting conferences on attitudes toward reading and classes in reading skills, reading skill achievement, and goal-setting behavior. Two parallel studies were conducted using students in two units of a multiunit elementary school, who were placed in three treatment groups: individual goal-setting conferences, individual conferences, and control.

Achievement level, attitude toward reading, number of goals set and achieved, and confidence in achievement of goals were measured. The results showed no difference in attitude among the groups, but a difference in achievement level was shown in one study by those students participating in goal-setting conferences. They also showed a smaller absolute difference in number of goals set and achieved, but less confidence in achieving their goals.

Gilbert, L. E. An introduction of length concepts to kindergarten children. Technical Report No. 102. 92 pp. July 1969. ED 036 335.

This study was an attempt to explain mathematically the concept of length to kindergartners. Conservation of length is generally not achieved, according to Piaget, until the age of 7 or 8.

Godfrey, L. D. A study of the rote-conceptual and reception-discovery dimensions of learning mathematical concepts. Technical Report No. 307. (Ph.D. dissertation) 5.1.20.50.06.01.03. 188 pp. in 2 parts. August 1974. Part 1: ED 102 024; Part 2: ED 102 025.

The rote-conceptual and reception-discovery dimensions of learning were studied. The study was designed not only to allow study of the hypothesized main effects and interactions between these dimensions, but also to determine the feasibility of studying the learning of relations between concepts.

Conclusions drawn from the study are: (1) there are differences between rote and conceptual learning and between reception and discovery learning that can be studied using hierarchies of mathematical concepts as the content to be learned and by fitting observed data to different models of learning noting variation in parameters and fit; (2) rote learning does not hinder conceptual learning; (3) if there is an interaction between rote-conceptual and rote-discovery learning, either in learning concepts or in learning relations between concepts, more refined methods are needed to analyze them.

Goldring, S. L. The effect of presentation and test mode on short term retention of words. Technical Report No. 68. 17 pp. January 1969. ED 064 656.

This experiment employed Sternberg´s procedure to investigate the effects of presentation and test modalities (auditory or visual) and number of presentations on the processing rate of monosyllabic words of varying graphemic and phonemic length. Twenty college students and 20 sixth graders served as Ss. Each S received all conditions and lists in a 10 x 10 graeco-latin square design.

Golub, L. S., & Fredrick, W. C. Linguistic structures and deviations in children´s written sentences. Technical Report No. 152. 11 pp. December 1970. ED 048 272.

The types of linguistic structures and deviations appearing in the written discourse of fourth and sixth graders were tabulated. The discourse samples were grouped into three categories, high, medium, and low, and then compared on each of 63 measures. Themes rated high were longer than average while low themes were shorter and showed little use of such structures as subordinate clauses, modals, and adverbs. Grade and sex differences were apparent in the measures. Females produced more discourse than males and sixth graders wrote longer T-units than fourth graders. Syntactical and lexical deviations were counted and categorized. Only 24 categories of syntactic deviations appeared and the lexical deviations also seemed to fall into a few general groups. Such groupings present the possibility of a rational approach to teaching the standard syntax and spelling. Implications of the results for the elementary language program are stated.

Golub, L. S., & Fredrick, W. C. Linguistic structures in the discourse of fourth and sixth graders. Technical Report No. 166. 36 pp. July 1971. ED 058 322.

This paper is part of an attempt to measure the language behavior of students in the upper elementary grades. It describes the procedures and results of research in five areas: (1) Relationship between the Linguistic Ability Test and the written discourse of fourth and sixth grade students; (2) Comparisons of the discourse of fourth and sixth graders and of males and females; (3) Analysis of the effects of color and abstractness of pictures and of the specificity of instructions used in obtaining written discourse samples; (4) Comparisons of written discourse rated good, average, and poor; (5) Comparison of oral and written discourse. Discourse samples from 160 Ss were measured using 63 variables that considered both quantity and complexity of output.

Golub, L. S., Fredrick, W. C., & Barganz, R. A. Present and proposed needs, objectives, and components of a language learning program. Theoretical Paper No. 29. 83 pp. September 1971. ED 058 223.

The general purpose of this paper is twofold. One is to survey the research and literature on the learning of oral and written language in the elementary schools. The other is to propose a statement of needs, objectives, and components for an oral and written language program for elementary grade children.

The method used for this study consists of five steps: (1) A survey and consensus of knowledge expressed by (a) language scholars and researchers, (b) curriculum specialists, and (c) teachers and other practitioners; (2) A survey of materials and methods presented in current textbooks for teachers and students; (3) A survey of students' and teachers' future needs in school and society; (4) Statements of needs and objectives of an elementary oral and written language program; and (5) A proposal for the components of such a program. The results of each of these steps are presented in this paper.

Gustafson, D. J. Learnability of basic sight words. Technical Report No. 262. (Ph.D. dissertation) 83 pp. August 1973. 5.1.20.40.01.01.08.

This study was designed to rank the first 100 words of the Great Atlantic and Pacific Sight Word List according to learnability. The differences in the learnability rankings of the words due to sex and the relationship between the learnability and frequency rankings of the words were also examined. Subjects were 200 kindergarteners from randomly selected classrooms. Three rank-order lists of the words were obtained: list by total sample, list by males, and list by females. The correlation coefficient between the lists by males and females was .67 (p is less than .01).

It was concluded that: (1) a rank-order of the first 100 words of the Word List had been determined. (2) The sex of the subject seemed to be related to the learnability of some words, but the real significance of this relationship was open to question. There was no significant difference in overall learning by males and females. (3) The frequency and learnability rankings of the words were not related.

Haertel, G. D. An examination of the relationship between memory and higher thought processes using a sample of fifth grade children. Technical Report No. 378. 5.1.20.21.03.01.02. 92 pp. August 1976.

This study examined the relationship between memory and higher thought processes. Jensen (1969), in his article, How Much Can We Boost Scholastic Achievement and IQ?, was the most recent proponent of a two-factor model of intelligence in which mental abilities can be divided into memory and higher mental processes labeled "Level I" and "Level II." This study employed statistical methods characteristic of construct validation to examine a battery of memory, intelligence, and achievement tests, seeking evidence of the existence, convergent validity and discriminant validity of the construct of Level I and Level II intelligence.

The study is significant given the controversy surrounding Jensen's theory of intelligence. Although the study does not examine differences between racial or SES groups, it suggests that Jensen's constructs do not constitute coherent psychological traits, precluding their inclusion in a working theory of intelligence. Furthermore, the results are of use to educators, cautioning them against the use of differential instructional approaches with children from different SES groups, as Jensen suggested.

Heckler, J. H. Some factors involved in the comprehension of prose materials. Technical Report No. 339. 5.1.20.42.01.01.03. (Ph.D. dissertation) 162 pp. July 1975.

This study examined various strategies to improve the reading comprehension of readers with deficits in decoding and vocabulary skills. Average and deficient readers were compared for performance on a comprehension task under three instructional-treatment conditions and two input modalities. The treatments included imagery, incentive, and control under both reading and listening modalities.

Contrary to expectations, instructions to image did not facilitate comprehension for either the average readers or the deficient readers.

Overall, the average readers performed equally well no matter which experimental condition they were in, but the deficient readers improved significantly when they moved from reading to listening.

It was concluded that deficient readers can comprehend prose materials as well as average readers when they are presented in a manner which minimizes skills in decoding and vocabulary. Other possible factors such as motivation, memory, or association of facts are not necessarily involved.

Hobbs, C. E. An analysis of fifth grade students' performance when solving selected open distributive sentences. Technical Report No. 397. (Ph.D. dissertation) 5.1.20.50.03.01.03. 177 pp. September 1976.

The investigation sought to study elementary school students' performance when solving selected open distributive sentences in relation to three factors--Open Sentence Type, Context, Number Size--and to study students use of the distributive principle as related to selected levels of their recognition of that distributive principle. Also, solution methods attempted by students and students' errors in performance were identified and classified.

A major implication of these investigations is that the pedagogical reason for teaching the distributive principle may not hold true for elementary school students. The postponement of a formal introduction to the distributive principle until students reach a higher level of mathematical maturity may very well be a wise decision to make. If this postponement occurs, implications for a change in rationalization and introduction of multiplication algorithms in the elementary school must be considered.

Hooper, F. H., & DeFrain, J. D. The search for a distinctly Piagetian contribution to education. Theoretical Paper No. 50. 5.1.20.10.01.02.01. 34 pp. July 1974.

Attempts to apply Piagetian theory and research to educational settings are reviewed and evaluated. The fundamental assumptions of Piagetian theory are briefly summarized and the educational philosophy of Piaget is presented. Five representative early childhood education programs (as designed by Lavatelli, Weikart, Kamii and DeVries, Furth and Wachs, and Bingham-Newman and Saunders) are described and related. Current criticisms of Piagetian theory and associated educational recommendations are reviewed and it is concluded that adopting a genuine Piagetian perspective conveys mixed blessings upon the aspirant educational innovator. The major valid principles which may be derived from the Piagetian system include: (1) awareness of intellectual product/process distinctions, (2) recognition of the crucial role of play activities, social interaction, and associated peer group processes, and (3) essential stipulation of self-initiated active involvement as the primary determinant of intellectual development. The third principle provides the fundamental continuity between Piaget's views and the numerous open classroom and self-discovery learning approaches to educational innovation.

Hudson, B. S. An assessment of the attitudes of secondary level teachers toward incorporating reading skills with content. Technical Report No. 329. (Master's thesis) 5.1.20.40.01.01.06. 21 pp. March 1975. ED 105 446.

The attitudes of secondary level teachers toward incorporating the teaching of reading skills with content were assessed. Two groups of teachers were contacted: those who have the services of a reading consultant, and those who do not. The assessment was accomplished by means of an attitudinal inventory.

The results of the study indicated that teachers from both groups see the necessity of incorporating the teaching of reading skills in their classes. Content area teachers generally feel inadequate to incorporate reading skills without aid, however. The reading consultant's role is to aid the teacher in seeing what can be done and then assisting and encouraging the teacher to accomplish that end.

Johnson, D. D. Factors related to the pronunciation of vowel clusters. Technical Report No. 149. (Ph.D. dissertation) 207 pp. September 1970. ED 049 910, Part 1; ED 049 911, Part 2; ED 049 912, Part 3.

The pronunciations given by children to synthetic words containing vowel clusters were analyzed in relation to common English words containing the same vowel clusters. Independent variables dealt with in the study were grade level, reading level, community background, and sex. The pronunciations of older children approximated the vowel.

Johnson, D. D. An investigation of sex differences in reading in four English-speaking nations. Technical Report No. 209. 20 pp. February 1972. ED 064 690.

Investigations reported during the past century have generally shown girls to be better readers than boys in the United States. Some researchers have attributed these differences to biological-maturational factors; others have suggested cultural-societal causes. The present study sought to examine this dichotomy by testing the reading ability of boys and girls in four English-speaking nations. More than a thousand elementary children from Grades 2, 4, and 6 in Canada, England, Nigeria, and the United States participated. Each subject was tested for reading comprehension, vocabulary, and various word analysis skills. A univariate analysis of variance in which sex (2) was nested within grade (3) and grade (3) within country (4) was applied to the data for each of eight analyses. Dependent variables were raw test scores, grade equivalent scores, or composite scores. In two countries, England and Nigeria, boys generally scored higher than girls and the sex differences favoring boys increased by sixth grade. Conversely, in Canada and the United States girls generally scored higher than boys and the sex differences favoring girls diminished or disappeared by sixth grade. Results of the study indicate that sex differences in readng ability are culturally related.

Johnson, D. D., & Venezky, R. L. An instrument for testing pronunciations of vowel clusters. Part I: Linguistic background. Technical Report No. 137. 30 pp. July 1970. ED 046 626.

This report is the first of two describing a study of factors influencing children's pronunciations of vowel clusters at different ages. In this report are presented data on vowel cluster pronunciations in English, the linguistic rationale for the selection of vowel digraphs used in the study, and a description of the testing instrument devised. Results of the study will be presented in a second report.

Johnson, D. D., & Venezky, R. L. Models for predicting how adults pronounce vowel digraph spellings in unfamiliar words. Technical Report No. 346. 5.1.20.45.01.07.02. 18 pp. October 1975.

The study was designed to explore relationships between type and token frequencies and contextual position effects; specifically, the major question was whether or not vowel cluster pronunciation preferences of adult readers were more affected by frequency of occurrence than by graphemic environment. Two opposing hypotheses were tested regarding four vowel digraph spellings. Six synthetic words were constructed for each vowel cluster according to contextual and word position constraints. Three models were constructed to assess the hypotheses and to predict responses for each vowel cluster. The models were a final consonant model, a variant type-token model, and an invariant principal response model. The final consonant model was superior to the other two models, but it was found that other factors, not yet assessed, were present in the results.

Jurdak, M. E. The effects of emphasizing mathematical structural properties in teaching and of reflective intelligence on four selected criteria. Technical Report No. 275. (Ph.D. dissertation) 5.1.20.50.05.01.01. 178 pp. September 1973.

This study had two general aims: (1) To compare, on predetermined criteria, the effectiveness of two teaching methods having two distinct levels of emphasis on mathematical structure in organizing and presenting the same mathematical content, and (2) to identify the effect of a cognitive ability known as reflective intelligence on four cognitive levels of learning a second-order mathematical structure whose learning depends on an already learned first-order system.

It was found that (1) the first treatment was relatively superior to the second in producing better performance on the first two performance measures. (2) There is no evidence that the emphasis on structural properties in teaching is conducive to better performance on the second two performance measures. (3) Better performance on each of the measures is associated with higher level of reflective intelligence in learning a second-order mathematical system.

Kamil, M. L. Memory for parallel structure and repeated items in compound sentences and digit, letter, and word strings. Technical Report No. 119. (Ph.D. dissertation) 95 pp. March 1970.

Five experiments were conducted to answer two major questions about short-term memory for sentences: First, what are the specific effects of repeating words in compound sentences? Second, what are the differences in encoding processes in short-term memory for natural language materials compared with nonlinguistic material?

The findings point to a general short-term memory encoding strategy for compound sentences and digits, letter, and word strings with compound structures.

Kennedy, B. J. *Motivational effects of individual conferences and goal setting on performance and attitudes in arithmetic*. Technical Report No. 61. Out of print. 20 pp. July 1968. ED 032 113.

The purpose of this experiment was to compare the motivational effects of cognitive incentives in the form of different goal-setting techniques and to investigate the combined effects of cognitive incentives with social interaction in individual pupil/teacher conferences. Results are discussed and interpreted in relation to a classroom research setting.

Kerst, S. M. *Memory as a constructive process*. Theoretical Paper No. 48. 5.1.20.42.01.01.12. 21 pp. January 1974. ED 099 793.

Evidence from studies of memory for meaningful materials such as sentences and prose passages is reviewed with emphasis on its implications for the nature of the memory representation. It is argued that models of memory which involve the retrieval of stored copies of originally presented material cannot account for two crucial phenomena: the retention of meaning in spite of losses in memory for specific wording, and the "recall" of information which could only have been obtained by inference. Views of memory which include varying degrees of constructive, interpretive, and reconstructive processes are considered as alternatives to the copy model. These alternatives include theories based on psycholinguistic constructs and visual imagery, as well as positions involving the abstraction and reconstruction of information by means of more general integrative representations.

Klausmeier, H. J., Davis, J. K., Ramsay, J. G., Fredrick, W. C., & Davies, M. H. *Concept learning and problem solving: A bibliography, 1950-1964*. Technical Report No. 1. Out of print. 80 pp. October 1965. ED 010 201. Replaced by Technical Report No. 82.

In addition to the bibliography, a definition of concept in terms of attributes and a taxonomy of variables in concept learning are incorporated into the report. Articles from the 45 journals scanned are listed alphabetically by author in either a concept-learning or a problem-solving section and in a combined bibliography by journal by year. An author index is included.

Klausmeier, H. J., & Feldman, K. V. *The effects of a definition and a varying number of examples and nonexamples on concept attainment*. Technical Report No. 280. 5.1.20.25.01.01.03. 9 pp. October 1973.

Fourth grade children read experimental lessons, each of which presented one of the following: a concept definition and placebo material; a rational set of examples and nonexamples of the concept and placebo material; the definition, a rational set, and placebo material; or the definition and three different rational sets. Control children read the placebo material only. Each experimental group performed significantly better than the controls, and children reading a lesson with a definition and three rational sets performed significantly better than those who received only a definition. The use of rational sets of concept instances and of a concept definition are validated as powerful controllable variables in instructional material.

Klausmeier, H. J., Robinson, P. E., Frayer, D. A., & DeVault, M. L. *A supplement to Technical Report No. 82. Concept Learning: A bibliography, July-December 1969.* Technical Report No. 147. 36 pp. November 1970.

This report, a supplement to Technical Report No. 82, is designed to aid the researcher concerned with concept learning. It contains (1) rationale and strategy for compiling a bibliography of articles concerned with concept learning, (2) a definition of the word "concept," (3) a system for classifying articles by their content, (4) a bibliography of relevant articles arranged alphabetically by author, and (5) a bibliography of the articles arranged according to their content.

Klausmeier, H. J., Frayer, D. A., & Sunde, M. L. *A supplement to Technical Report No. 82: Concept learning: A bibliography, 1970.* Technical Report No. 183. 49 pp. December 1971. ED 067 606.

This report, a supplement to Technical Report No. 82, is designed to aid the researcher concerned with concept learning. It contains (1) rationale and strategy for compiling a bibliography of articles concerned with concept learning, (2) a definition of the word "concept," (3) a system for classifying articles by their content, (4) a bibliography of relevant articles arranged alphabetically by author, and (5) a bibliography of the articles arranged according to their content.

Klausmeier, H. J., Robinson, P. E., Frayer, D. A., & DeVault, M. L. *A supplement to Technical Report No. 82. Concept Learning: A bibliography, January-June, 1969.* Technical Report No. 120. 36 pp. March 1970. ED 043 092.

This publication contains a rationale and strategy for compiling the bibliography, a definition of the word "concept," a system for classifying articles by their content, a bibliography of articles dealing with concept learning, and a list of bibliographic entries grouping articles according to the classification system.

Klausmeier, H. J., Schilling, J. M., & Feldman, K. V. *Effectiveness of experimental lessons in accelerating children's attainment of the concept "tree."* Technical Report No. 372. 5.1.20.25.01.01.14. 43 pp. January 1976. ED 129 600.

Two studies were performed to determine the effectiveness of experimental lessons in accelerating children's attainment of the concept tree. In the first study a variation of the Solomon Four-Group design was used to determine, in addition, whether there were effects of pretesting. Subjects were 103 fifth grade children randomly assigned to experimental or control groups. A two-way analysis of variance showed that there were no significant effects of pretesting and no significant treatment effects. This was attributed to the fact that prior to instruction the subjects were already at a high level of attainment of the concept tree.

A replication of the study was performed using 64 third grade children as subjects. The lessons from the first study were revised to be appropriate for third grade children. Since no effects of pretesting were found in the first study, two groups were used in the second study: one experimental and one control. The instructional design and experimental procedures were the same as for the first study. An analysis of covariance showed that the experimental group performed significantly better than the control group on tests for the overall formal level and on three subtests of the formal level. Also, the percentages of experimental children passing the formal level were .03 and .68, respectively, for pretest and posttest; the same percentages for the control children were .03 and .14, respectively.

Klausmeier, H. J., Sterrett, B. E., Frayer, D. A., Lewis, S. B., Lee, V. W., & Bavry, J. L. Concept Learning: A bibliography, 1950-1967. Technical Report No. 82. (Replaces Technical Report No. 1.) 171 pp. April 1969. ED 035 954.

This publication contains a rationale and strategy for compiling the bibliography, a definition of the word "concept," a system for classifying articles by their content, a bibliography of articles dealing with concept learning, and a list of bibliographic entries grouping the articles according to the classification system. Technical Report No. 107 is a supplement to this report.

Klausmeier, H. J., Sterrett, B. E., Robinson, P. E., Frayer, D. A., & Bavry, J. L. A supplement to Technical Report No. 82. Concept Learning: A bibliography, 1968. Technical Report No. 107. 62 pp. November 1969. ED 036 865.

Included in this report are: Rationale and strategy for compiling a bibliography of articles concerned with concept learning, a definition of the word "concept," and a bibliography of the articles arranged according to their content.

Klumb, R. W. The effects of monitoring pupil performance and two incentive treatments for teachers on pupils' reading skill development and teachers' attitudes. Technical Report No. 268. (Ph.D. dissertation) 5.1.20.40.01.01.01. 143 pp. August 1973.

This study investigated the effects of three motivational treatments given to selected teachers. The effects of the treatments were measured in terms of changes in pupil reading achievement and staff teachers' perceptions of selected interpersonal variables. The three motivational treatments were characterized by pupil reading achievement monitored without feedback to teachers, social incentives given to teachers, and money incentives given to teachers. The effects of the three motivational treatments were compared in one control and three experimental groups.

There were three main conclusions: (1) In all of the treatment groups and on all but three of the WTRSD measures, the percentage of pupils mastering skills was significantly higher at the p less than .0001 level on the posttest than on the pretest. (2) A comparison between the gains in the percentage of pupils mastering skills between treatment groups was not significantly different at the p less than .05 level except for one skill. (3) The analysis of the teacher questionnaires revealed that for all of the treatment groups and on all of the measures of teachers' perceptions there were no significant changes at the p less than .05 level.

Koenke, K. The effects of a content-relevant picture on the comprehension of the main idea of a paragraph. Technical Report No. 56. Out of print. 34 pp. June 1968. ED 024 540.

The importance of content-relevant pictures to the comprehension of the main idea in a paragraph was investigated. Various reading conditions were constructed which contained a paragraph, a picture, or both, each with three types of instructions. In addition, the effects of readibility of the paragraphs and grade placement of the students (third and sixth grades) were examined.

Kurth, R. J. Evaluation of an objective-based curriculum in Word Attack. Technical Report No. 289. 5.1.20.40.01.01.09. 94 pp. May 1975.

This study was designed to test the functional word attack ability of subjects who had been taught the subskills of word attack according to an objective-based, skill-oriented approach. Word lists were developed to test the subjects' ability to decode synthetic words which used specific phonic and structural subskills of word attack, phonically and structurally regular words, and phonically and structurally irregular words.

Subjects who had completed the Word Attack Element of the Wisconsin Design were able to decode the synthetic words at the suggested 80 percent mastery level. Not all of the subjects were able to decode all of the phonically and structurally regular words at an 80 percent mastery level, but they did attain higher scores on the tests of regular words than they did on the tests of irregular words.

While this study does not prove that mastery of the basic subskills of word attack results in functional word attack ability, it does indicate that such subskills have some value for the student faced with the task of decoding words.

Lesgold, A. M., Levin, J. R., Shimron, J., & Guttmann, J. Strategies in reading comprehension IV: Pictures and young children´s learning from oral prose. Technical Report No. 328. 5.1.20.42.01.01.02. 16 pp. February 1975.

Several experiments examining the effects of overt illustration on first graders´ learning from oral prose are reported. In all experiments, children heard prose selections and illustrated selection content with plasticized figure cutouts and background scenes. Control subjects copied or colored geometric forms during the illustration period. After hearing three or five passages, subjects orally recalled passage content and answered simple factual questions about each passage. Illustration facilitated prose learning only when the child was given the correct pieces for his illustration or had the illustration done for him. When children selected the pieces for each illustration out of a common pool of 20-30 cutouts, illustration activity had either a negative or no effect.

Leslie, R. C. Position saliency in children´s short term recognition memory for graphic patterns. Technical Report No. 351. 5.1.20.45.01.01.01. (Ph.D. dissertation) 124 pp. November 1975. ED 116 155.

This study presents an account of position saliency in terms of the child´s ability to utilize graphic information, and in particular the serial encoding of information from letters in a graphic pattern. By varying the number and position of the letters distinguishing graphic patterns (Pos condition) in a short-term recognition memory (STRM) task, the relative use of information from different parts of the graphic pattern can be determined. Under STRM, the subject must analyze, remember, and utilize the graphic information from the Target (T) stimulus, in judging whether the Comparison (C) stimulus is the same as the T stimulus.

This study supports the notion that the initial letter position becomes a salient cue in word identification. Furthermore, this position saliency can occur prior to reading instruction per se. Children develop a left-to-right processing strategy which is revealed by varying the processing time. From the finite state model we can conclude that children´s decisional processes vary with their information about the stimuli.

Levin, J. R. Some thoughts about cognitive strategies and reading comprehension. Theoretical Paper No. 30. 8 pp. December 1971. ED 064 692.

Psychological experiments investigating imposed and induced cognitive strategies are reviewed and related to operations in reading comprehension. It has been suggested that comprehension differences between good and poor readers may arise from the way in which they habitually organize intra- and inter-sentence elements during input. Subject-generated visual imagery is singled out as a particularly effective organizational strategy. Implications of this research are considered in the context of aptitude by treatment interactions and individual differences.

Levin, J. R., & Divine-Hawkins, P. Strategies in reading comprehension: III. Visual imagery as a psychological process. Technical Report No. 254. 9 pp. June 1973.

The viability of visual imagery as a prose-learning process was evaluated in two experiments with elementary-school children. In the first experiment, it was found that when a passage was presented at a normal rate the effect of imagery instructions on substance recall was relatively greater under listening than under reading conditions. This finding was replicated in the second experiment where it was also found that reported imagery generation was more frequent in listening than in reading conditions when a faster presentation rate was employed. Possible interpretations of the results with respect to a "compatibility" hypothesis are offered.

Levin, J. R., Divine-Hawkins, P., & Kerst, S. M. Strategies in reading comprehension: II. Individual differences in learning from pictures and words. Technical Report No. 250. 13 pp. April 1973.

An instrument was developed for determining whether or not an individual learns relatively better from pictures than words. Based on this instrument, repeated classifications of a fourth grade sample were found to be quite consistent. Moreover, when applied to the comprehension of prose materials, the instrument served to identify those children for whom self-generated visual imagery would constitute an effective organizational strategy.

Levin, J. R., & Guttmann, J. Strategies in reading comprehension: Individual differences in learning from pictures and words (A footnote). Technical Report No. 300. 5.1.20.42.01.01.13. 3 pp. February 1974.

In a recent experiment it was discovered that although many children learn uniformly well (or poorly) from pictures and words, others learn appreciably better from pictures. The present study rules out an alternative explanation of those data--which had been produced on a single learning task containing both pictures and words--by obtaining predictably different "learner type" profiles under independently administered picture- and word-learning tasks.

Levine, J. M., & Allen, V. L. Reactions to attitudinal deviancy. Theoretical Paper No. 14. 16 pp. November 1968. ED 064 659.

This analysis of social influences on human learning presents a critical review of empirical and theoretical treatments of group reaction to attitudinal deviancy. Data are presented which indicate that individuals who deviate in non-attitudinal spheres are not always rejected. In some settings, they are not only tolerated, but also encouraged.

Marliave, R. S. Attitude, self-esteem, achievement, and goal-setting behavior associated with goal-setting conferences in reading skills. Technical Report No. 176. (Master's thesis) 116 pp. October 1970. ED 057 404.

This study was designed to investigate the effects of goal-setting conferences on attitude, self-esteem, achievement, and goal-setting behavior. Fourth grade Ss were divided into high, medium, and low levels of previous reading achievement. Twenty-one Ss were randomly selected from each achievement level and randomly assigned to one of three treatment groups: goal-setting conference, conference-only, or control.

After four weeks of treatment, attitude, self-esteem, and achievement were measured with the Reading Attitude Inventory, the Self-Esteem Measure, and subtests of the Wisconsin Tests of Reading Skill Development, respectively. During the fifth week, Ss in both the goal-setting and conference-only groups set goals, and data were gathered on their goal-setting behavior. The effect of previous level of achievement was significant in terms of attitude, self-esteem, achievement, and goal-setting behavior. No other significant effects were found.

Marshall, J. L. The mean split-half coefficient of agreement and its relation to other single-administration test indices: A study based on simulated data. Technical Report No. 350. 5.1.20.50.06.01.02. 177 pp. June 1976.

This report provides a summary of the rationale for questioning the applicability of classical reliability measures to criterion-referenced tests; an extension of the classical theory of true and error scores to incorporate a theory of dichotomous decisions; a presentation of the mean split-half coefficient of agreement, a single-administration test index designed to measure the internal consistency of dichotomous classifications; and information concerning the properties, under varying conditions of this new coefficient and several other single-administration test indices, as well as their interrelationships.

McLeod, D. B. The effectiveness of an inservice program for implementing an activity approach to learning mathematics in the elementary school. Technical Report No. 245. (Ph.D. dissertation) 181 pp. November 1972. ED 073 943.

The purpose of this study was to determine the effectiveness of an inservice program designed to help elementary school teachers implement an activity approach to learning mathematics in their classrooms. The teachers were provided with Developing Mathematical Processes (DMP), a new elementary mathematics program developed by the Wisconsin Research and Development Center for Cognitive Learning.

The inservice program was designed to help teachers achieve 24 behavioral objectives or competencies related to implementing an activity approach. These behaviors dealt with the use of instructional and assessment materials, the verbal behavior of the teacher, the organization of the classroom, the teacher's knowledge of mathematics, and managing instruction in order to provide for individual differences.

The evaluation procedures included classroom observations, questionnaires, and interviews. Appropriate instruments of each type were developed to measure teacher performance and other characteristics.

The success of the inservice program was judged by comparing the teacher's performances on the objectives with performance criteria. The teachers in the study exceeded the criterion levels on 13 of the 24 objectives, and multiunit teachers reached the criterion levels on three additional objectives; teacher performance did not seem to be related to teacher characteristics such as age, experience, or professional activities.

McMurray, N. E., Bernard, M. E., & Klausmeier, H. J. *Lessons designed to teach fourth grade students the concept equilateral triangle at the formal level of attainment*. Practical Paper No. 14. 5.1.20.25.02.01.01. 50 pp. September 1974. ED 100 720.

Several instructional strategies have been identified as being facilitative of concept learning: (a) use of definition, (b) empirical selection of concept examples through an instance probability analysis, (c) use of rational sets of examples and nonexamples, (d) pairing of examples with nonexamples, (e) emphasis of relevant attributes, (f) teaching of a strategy, (g) feedback, and (h) active involvement by the student.

This practical paper contains written instructional lessons incorporating the above strategies and developed for a study to determine whether fourth grade students could attain the concept *equilateral triangle* at a higher level than it is normally attained at that grade.

McMurray, N. E., Bernard, M. E., & Klausmeier, H. J. *An instructional design for accelerating children's concept learning*. Technical Report No. 321. 5.1.20.25.01.01.04. 16 pp. June 1975.

An instructional design based on task analysis procedures was used to develop two experimental lessons to accelerate attainment of a subject-matter concept by fourth grade students. A variation of the Solomon Four-Group design was employed to determine the effects of the pretest. Performance of 118 randomly assigned subjects on a measure assessing two levels of concept mastery showed that experimental groups performed significantly better at both levels than control groups. Effects of the pretest were not significant. A two-month follow-up assessment revealed highly comparable results.

Melvin, M. P. *Instructional programming for individual students in the multiunit school: A case study*. Technical Report No. 393. (Ph.D. dissertation) 5.1.20.40.04.01.03. 228 pp. August 1976.

The study was conducted to determine how instructional programming for individual students has been implemented to provide effective learning environments for elementary school students. The primary focus was on the entire range of procedures used to achieve the objectives of the Instructional Programming Model (IPM). A secondary focus was on the multiunit school organization as it relates to implementing instructional programming.

One IGE school was selected for this case study. The school met the minimal criteria for an IGE school and had implemented instructional programming in reading and mathematics. Data collection procedures included the use of questionnaires, a two-week period of observation and interviewing, and use of documents available at the school. The data were analyzed in relation to questions posed for the study.

Generalizations about the multiunit school and instructional programming were generated from the data. These included (1) The most difficult aspect of implementing the multiunit school organization is organizing students in multiaged teams; (2) A reading specialist who coordinates the school-wide reading program, instructs groups of students, and provides other assistance as requested by the team staffs is a valuable asset in implementing instructional programming in reading; (3) Following the steps of the IPM does not tend to encourage student decision making related to objectives, instructional modes, or sequence; and (4) The successful implementation of instructional programming may depend on frequent informal interaction among team members as much as on the more formal interaction of regular team meetings.

Meyer, R. A. A study of the relationship of mathematical problem solving performance and intellectual abilities of fourth grade children. Technical Report No. 379. (Ph.D. dissertation) 5.1.20.50.07.01.02. 314 pp. in 3 parts. February 1976.

This study investigated relationships between mathematical problem solving performance and intellectual abilities of fourth grade children. The study is modeled after the Structure of Concept Attainment Project (CAA) of Harris and Harris (1973) so questions were asked about the relationships of the structure of mathematical problem solving performance of the subjects from this study with the population from the 1971 CAA study.

Montgomery, M. E. The interaction of three levels of aptitude determined by a teach-test procedure with two treatments related to area. Technical Report No. 235. (Ph.D. dissertation) 135 pp. September 1972. ED 071 761.

The general problem addressed concerns formative evaluation relevant to curriculum development. More specifically, the process of measuring as it relates to primary students was considered. This was narrowed to examining the interaction of two treatments on measuring area with various levels of aptitude. The research strategy was that of an aptitude-treatment interaction (ATI) study. The specific question asked was: In what manner does the ability of children to learn concepts associated with a unit of length affect the extent to which they attain concepts associated with area and a unit of area for each of the two given treatments?

Both treatments had the same behavioral objectives, the same teacher, the same duration (9 days) and the same mode of instruction. They differed in their treatment of the unit of measure for area. After the treatments three measures, achievement, transfer and retention, were taken. These measures were used to test hypotheses about the interaction of aptitude with treatments and about the main effects of aptitude and of treatment.

No significant interactions were found between the aptitudes and treatments on any of the measures. There were significant main effects due to aptitude and to treatment for achievement and retention measures.

Naeser, M. A. Criteria for the segmentation of vowels on duplex oscillograms. Technical Report No. 124. 18 pp. March 1970. ED 041 280.

This paper develops criteria for the segmentation of vowels on duplex oscillograms. Previous vowel duration studies have primarily used sound spectrograms. The use of duplex oscillograms, rather than sound spectrograms, permits faster production (real time) at less expense (adding machine paper may be used).

Nelson, B. A., & Frayer, D. A. The effects on short- and long-term retention of discovery and expository methods of presenting selected geometry concepts: A replication. Technical Report No. 208. 37 pp. February 1972. ED 065 314.

This study was designed to investigate the effects of discovery and expository methods of presentation on the immediate acquisition and retention of geometry concepts by seventh graders. Four geometry concepts, quadrilateral, rhombus, trapezoid, and parallelogram, were presented in written lessons which used either an expository or a discovery approach. Ss studied the lessons on four consecutive days. They were given a test on the concepts either immediately after completion of the lessons or 1 day or 21 days after completion of the lessons. Ss who received the test 1 day after completion were retested 21 days after completion.

The findings of the study were as follows: (a) Ss who studied the expository lessons had significantly higher socres than Ss who studied the discovery lessons. (b) An independent groups analysis revealed no significant difference between treatment groups. However, a repeated measures analysis revealed that Ss in the discovery group tended to forget less than Ss in the expository group over the 21-day retention interval. (c) The expository group spent only one-third as much time on the lessons, yet had immediate acquisition superior to the discovery group and 21-day retention equal to the discovery group.

Olton, R. M., Wardrop, J. L., Covington, M. V., Goodwin, W. L., Crutchfield, R. S., Klausmeier, H. J., & Teckla, R. The development of productive thinking skills in fifth grade children. Technical Report No. 34. 39 pp. November 1967. ED 021 312.

Self-instructional programmed lessons were used to study the relationships (1) between productive thinking abilities and other learner characteristics such as IQ and sex, and (2) between level of productive thinking performance and classroom environment as judged to facilitate creative thinking.

Otto, W. The relationship of reactive inhibition and school achievement: Theory, research, and implications. Occasional Paper No. 4. 8 pp. September 1966. ED 010 507.

Drawing on theory and existing research, the author examines the relationship of reactive inhibition to achievement in the basic school subjects. Within an underlying assumption that at least the early stages of basic skill learning take place by operant conditioning, inhibitory potential may be a potent determiner of later achievement.

Otto, W., & Askov, E. *The role of color in learning and instruction.* Theoretical Paper No. 12. 10 pp. March 1968. Out of print. ED 021 697.

This paper reviews the existing research relating to the function of color in learning, examines the rationale for present applications of color in instructional materials, and considers the implications regarding the use of color as an aid to learning.

Otto, W., & Barrett, T. C. *Two studies of children's ability to formulate and state a literal main idea in reading.* Technical Report No. 57. Out of print. 25 pp. June 1968. ED 024 543.

This report deals with two studies that investigated the ability of young children to formulate and state the main idea in a paragraph. A substantial portion of the report is devoted to methodological matters: an operational definition of *main idea*, appropriate reading materials, and a method for evaluating responses.

Otto, W., & Cooper, C. *Investigations of the role of selected cues in children's paired-associate learning.* Technical Report No. 53. Out of print. 20 pp. May 1968. ED 036 315.

Four studies in a series dealing with good and poor readers' utilization of selected cues in paired-associate learning are reported. Specific cues considered were color, order of presentation, and verbal mediators.

Otto, W., & Rarick, G. L. *Effect of time of transition from manuscript to cursive writing upon subsequent performance in handwriting, spelling, and reading.* Technical Report No. 47. Out of print. 11 pp. April 1968. ED 016 575.

This study was designed to determine whether the handwriting, reading, and spelling performance of fourth and sixth grade children is related to the time when the transition from manuscript to cursive writing is made.

Otto, W., & Stallard, C. *One hundred essential sight words.* Theoretical Paper No. 60. 5.1.20.40.01.02.01. 18 pp. October 1975. ED 116 156.

Sight word lists have been used since prior to 20 B.C. and have changed forms many times. Today sight word lists are numerous and are widely and variously used. They differ in source, intended purpose and/or audience, and criteria for including specific words. Despite the differences, there is much agreement that they do reflect the most basic words in our language and that there is a high degree of commonality among them. This report identifies the 100 sight words which appear in the 16 major sight word lists.

Pereira, W. C. De A. *The relationship between girls overt verbalization, performance, retention, rules and strategies as they learn a mathematical structure: A study based on elements of a potential theory which relates thinking, language, and learning.* Technical Report No. 293. (Ph.D. dissertation) 5.1.20.50.05.01.03. 156 pp. November 1973.

The study was designed to describe the basis of a potential mathematics learning theory founded on the relationship between language and thinking; to gather evidence to test the validity of an initial empirical proposition relating to the *S*s´ overt verbalization and performance after they had been taught a mathematical structure; to gather evidence to test the validity of a second empirical proposition relating to the *S*s´ overt verbalization and the number of discovered rules which define the mathematical structure; and to examine the strategies the *S*s used in the learning of those rules.

Results indicate that (1) *S*s performed better, retained more, and discovered more rules when they were silent while doing the physical mathematical activities and afterwards answered questions and explained findings; (2) there was significant interaction between learning and questioning; (3) *S*s´ overt verbalization during questioning did not accelerate the learning process, which implies that language does not act as a shifter from the planes of perception and action to the plane of mental representation under these circumstances; (4) *S*s should work without overt verbalization during physical mathematical learning activities.

Peters, N. A. *Application of Jensen´s bidimensional model of learning to the reading process.* Technical Report No. 217. (Ph.D. dissertation) 56 pp. March 1972. ED 070 062.

Both associative and conceptual learning are presumed to be of importance in reading at all developmental levels. However, it is hypothesized in the present study that there is a stronger relationship between beginning reading and Level I (associative) learning than between beginning reading and Level II (conceptual) learning. Conversely, it is hypothesized that there is a stronger relationship between later reading and Level II (conceptual) learning than between later reading and Level I (associative) learning.

A total of 108 subjects from Grades 2, 4, and 6 were used in the study. An equal representation of good, average, and poor readers at each grade level and for both sexes was obtained.

The essential findings of the study were that there is (a) no significant difference between the performances of good, average, and poor readers on a Level I (associative) learning task at the first grade level; (b) no significant difference between the performance of good, average and poor readers on a Level I (associative) and Level II (conceptual) learning task at the fourth grade level; (c) no significant difference between the performance of boys and girls on Level I (associative) and Level II (conceptual) learning tasks.

Peters, C. A comparison between the Frayer model of concept attainment and the textbook approach to concept attainment. Technical Report No. 290. 5.1.20.40.03.01.01. 187 pp. February 1974.

The objective of this study was to determine whether the Frayer model of concept attainment, which encompasses a systematic procedure for defining concepts and structures material in a manner designed to facilitate comprehension for both good and poor readers, was superior to a method employed by many social studies textbooks in defining concepts. In addition, the influence organizational patterns of written material exerted on the comprehension process and the effect of poor versus good reading ability on organizing material into comprehensible units was investigated.

Results indicated that both good and poor readers who utilized material or organized according to the Frayer model received significantly higher comprehension scores than did good and poor readers who employed material organized according to the Textbook approach. However, arrangement of concept examples within both the Frayer and Textbook methods had no effect on comprehension scores.

Peterson, J. Effects of sex of experimenter and sex of subject in first and fifth grade children's paired associate learning. Technical Report No. 136. (Ph.D. dissertation) 64 pp. June 1970. ED 043 085.

The predominant use of female teachers in the elementary school is one of the variables to which the inferior learning rates of males in elementary school has been attributed. The implication is that male teachers in the elementary school would foster the academic growth of young males.

In lieu of male teachers at the primary level, this study was designed to determine the effect of the sex of the teacher/experimenter on the learning of a reading-like paired associate task by children in two elementary school grades.

With particular limitations in mind, it was noted that the sex of the teacher per se will not differentially affect the academic performance of boys and girls if both sexes are given equal opportunities to participate in instruction.

Peterson, G. W., Hooper, F. H., Wanska, S. K., & DeFrain, J. An investigation of instructional transfer effects for conservation transitive inference and class inclusion in kindergarten and first grade children. Technical Report No. 368. 5.1.20.10.01.01.03.04. 80 pp. March 1976.

The efficacy of small group instructional activities dealing with transitive inference, conservation, and class inclusion of length was investigated in a sample of kindergarten and first grade children. Assessment of instructional effects included pretesting, immediate posttesting, and delayed posttesting (three months subsequent to training) in addition to a quasi-standardized series of tasks based upon the concrete operations period groupements. Preliminary analyses indicated a lack of order of presentation effects, sex differences, tester and teacher biases, and pretest distinctions among the experimental conditions (six treatment conditions, three control conditions). The normative order of item difficulty and the associated differential instructional susceptibility indicated that concepts of transitive inference precede conservation which are in turn mastered prior to class inclusion understanding. Implications of these and additional findings for the status of cognitive stages of development are discussed.

Quilling, M. R. A data analysis approach to evaluating achievement and outcomes of instruction. Technical Report No. 338. 5.1.20.20.02.02.01. (Master´s thesis) 143 pp. June 1975.

Curriculum evaluation which focuses on the relationship of conditions and outcomes facilitates the "tuning" of instruction to maximize learning. The purpose of the present study is to illustrate how data analytic techniques may be usefully applied to curriculum evaluation carried out within such a framework. The particular application involves developing regression models that account for school achievement in terms of curricular and pupil variables and their interactions. While the overall approach to evaluation is not new, certain of the variables used in this study and the data analysis procedures have not been applied seriously in the context of evaluative research.

Ramsay, J. G. The attainment of concepts from figural and verbal instances, by individuals and pairs. Technical Report No. 4. (Master´s thesis) Out of print. 13 pp. January 1966. ED 010 204.

This study investigated the effects of two types of material and four sequences of concept presentation on the concept-learning performance of individuals and pairs. Five dependent variables were used to assess performance.

Ramsay, J. G. Concept learning as a function of the type of material and type of classification. Technical Report No. 58. 26 pp. June 1968. ED 024 099.

The effects of the number of relevant stimulus dimensions and figural versus verbal stimuli in the concept learning ability of college students are reported. Results force a consideration of mediational variables in explaining this form of cognitive learning.

Romberg, T. A. Four studies on aspects of assessing computational performance. Technical Report No. 297. 5.1.20.50.02.01.01. 110 pp. July 1975. ED 115 490.

This report documents four brief studies. Each deals with an aspect of assessing pupil performance on computational skills.

The first study reports initial efforts to develop an oral speed test for addition facts. As a result, a reasonable instrument to measure speed of factual recall appears to be possible. The second was designed to see if responses to an addition and subtraction test with a new machine-scorable format were as reliable as responses on a simple completion or multiple-choice format. Results show the new format to be a workable alternative. The third study examined the effect of test item order--easiest to hardest, hardest to easiest, or random--on the performance of children wth different test anxiety levels. Although results failed to show significant differences between groups, the mixed order and low anxiety groups achieved somewhat higher means. The last study tested three methods of remedial instruction for the two-digit addition algorithm: hand-held calculator, sub-sums approach, and traditional carrying method. All three produced improvement, with the traditional method giving the best results.

Romberg, T. A., & Glove, R. Process models for predicting the difficulty of multiplication problems using flow charts. Technical Report No. 337. 5.1.20.50.02.01.01. 113 pp. in 2 parts. July 1975. Part 1: ED 115 491; Part 2: ED 115 492.

The purpose of this study was to determine whether a process model could be constructed which accounted for somewhat more variance in predicting the difficulty of two-digit multiplication problems than did a process model developed by Cromer (1971). Cromer's data and variables were used as a starting point. Ten new variables were identified from multiplication and addition flow charts. Seven basic models, 4 reduced models, 10 factor models, 24 one-variable models, and a set of systematic restricted models were examined. Multiple regression analysis was used to predict difficulty. The overall results indicate that the flow chart variables do produce somewhat better models.

Romberg, T. A., Shepler, J. L., & Wilson, J. W. Three experiments involving probability measurement procedures with mathematics test items. Technical Report No. 129. 29 pp. June 1970. ED 044 315.

This report presents the results of three experiments designed to study the utility of probability measurement procedures with mathematics test items.

The first two studies used test items measuring high-level cognitive abilities with eleventh and twelfth grade students. The third used information items measuring low cognitive abilities with eighth grade students.

Rude, R. T. Sex, intelligence, and school reading curriculum as factors influencing summer retention of overall reading ability and specific reading skills of first grade subjects. Technical Report No. 263. (Ph.D. dissertation) 5.1.20.40.01.01.02. 86 pp. August 1973.

This study was designed to assess the effect the summer vacation period has on the reading ability of first grade subjects, as measured by norm- and criterion-referenced reading tests. The data were analyzed to determine if sex of subject, IQ, or type of school reading curriculum were related to the ability to retain overall reading ability or specific reading skills.

Statistically significant differences were found between the mean spring and fall test scores on eleven of the fourteen measures. Sex of subject and type of school reading curriculum were not significantly related to ability to retain reading skills. Intelligence of subjects was found to be related to retention ability on only two of the measures.

It was concluded that the most meaningful measure of change was the difference between the percentage of subjects considered to have mastered the skills in the spring versus the percentage in the fall. The fifteen percent change between the two times was not considered great enough to suggest massive schoolwide retesting of all subjects in criterion-referenced reading programs. Instead, retesting of subjects might be done on the basis of teacher subjective judgment, thereby reducing the cost and time necessary to implement such a reading program.

Rudegeair, R. E. The effect of contextual influence on children's discrimination of initial consonants. Technical Report No. 146. (Ph.D. dissertation) 76 pp. September 1970. ED 047 307.

This study investigates whether modifications in the acoustic correlates of initial stops and fricatives due to the following vowel can affect phonemic decision processes. Two experiments were conducted to investigate contextual effects. In Experiment I, CV syllables comprised of stop plus a vowel were paired and presented to 36 first grade subjects in a discrimination task. Experiment II differed from I only in that it involved fricatives instead of stops.

The results showed that the effects of coarticulation do affect discrimination probabilities.

Rudegeair, R. E., & Kamil, M. L. Assessment of phonological discrimination in children. Technical Report No. 118. 17 pp. March 1970. ED 043 679.

A review of the literature led these investigators to conclude that conventional tests are inadequate for assessment of phonological discrimination ability in children. To reduce task difficulty, the investigators developed repeated contrast test pairs. Such pairs consist of CVC syllables in which the same phonemic contrast occurs twice (e.g., /bob/-/dod/).

The results have two major implications: First, repeated testing is a necessity for young children. Second, repeated contrast pairs may provide a means of obtaining a more complete assessment of phonological discrimination ability in children.

Saeman, R. A. Effects of commonly known meanings on determining obscure meanings of multiple-meaning words in context. Technical Report No. 148. (Ph.D. dissertation) 128 pp. September 1970. ED 050 087.

The primary purpose of the study was to determine whether more commonly known meanings of polysemantic words interfere with a child's use of semantic syntax to ascertain an appropriate obscure meaning in a sentence context. To achieve this general purpose, secondary purposes were defined: (1) to determine common and obscure meanings of multiple-meaning nouns, (2) to compare children's ability to use context to determine common meaning with their ability to use context to determine obscure meanings, (3) to ascertain whether error differences on common and obscure meanings were primarily attributable to both the lexical items which represent those meanings and the range of meanings for each item, and (4) to compare boys' and girls' ability in the use of context to determine whether this reading skill is better developed in young girls than young boys.

Schonberger, A. K. *The interrelationship of sex, visual spatial abilities, and mathematical problem solving ability in grade seven*. Technical Report No. 387. (Ph.D. dissertation) 5.1.20.50.07.01.05. 257 pp. in 3 parts. June 1976.

This study examined the hypothesis that males are more successful at solving mathematical and spatial problems than females and investigated the relationship between visual spatial abilities and mathematical problem solving ability.

The relationships between solving spatial problems, drawing diagrams, and solving mathematical problems were explored using a variety of correlational techniques; these included factor analysis, multiple regression analysis and canonical correlation analysis.

Schotanus, H. D. *The relationship between difficulty of reading material and attitude toward reading*. Technical Report No. 29. (Master's thesis) 14 pp. July 1967. ED 016 596.

A comparison between instructional reading level and difficulty level of reading materials selected by second graders for enjoyment was made. Previously determined attitudes toward reading were related to difficulty of chosen materials.

Schwenn, E. A., Sorenson, J. S., & Bavry, J. L. *The effect of individual adult-child conferences on the independent reading of elementary school children*. Technical Report No. 125. 18 pp. March 1970. Ed 040 841.

This study was conducted to determine the effectiveness of individual adult-child conferences in increasing the independent reading of elementary school children. During an 8-week baseline period, data on the number and difficulty level of books read by students in three grades (2, 4, and 6) were gathered. Only students who ranked in the lower two-thirds on this measure were included in the sample. Students were stratified into two reading achievement levels (high, low).

Although the conferences significantly increased the amount of the children's independent reading, they had little effect on the difficulty level of their reading. Nor did the conference condition produce a differential gain in reading achievement. The lack of effect of the conferences on achievement test scores was probably due to the relative brevity of the experimental period.

Scott, J. A. *The effect of selected training experiences on performance on a test of conservation of numerousness*. Technical Report No. 92. (Master's thesis) Out of print. 65 pp. July 1969. ED 036 334.

Eleven lessons were presented to kindergartners in an attempt to train them to identify properties of objects. It was concluded that such children can with little difficulty be taught to identify, discriminate, and label properties of objects and of sets of objects.

Scott, J. A. *The effects on short- and long-term retention and on transfer of two methods of presenting selected geometry concepts*. Technical Report No. 138. (Ph.D. dissertation) 152 pp. July 1970. ED 044 314.

Expository and discovery methods of presenting geometry concepts to sixth graders were compared, and effects of retention were tested after 1, 11, and 21 days.

The findings indicated that the method of presentation differentially affected retention of material, as test scores of subjects taught in expository mode decreased over time, and those of the subjects taught in discovery mode increased over time. No differential effect on transfer or immediate acquisition was found from method of presentation.

Smith, K. M. *The influence of cognitive style and intelligence variables in aided reading comprehension*. Technical Report No. 264. (Ph.D. dissertation) 5.1.20.40.03.01.02. 128 pp. August 1973.

The purpose of this study was to examine the interrelationships between five measures of aided reading comprehension (read to each subject while he silently read or followed along), intelligence, and three measures of cognitive style variables in first grade children. The *Wisconsin Tests of Reading Skill Development*, Level B-Comprehension, yielded five aided reading comprehension measures. Thirty-four first graders, 13 boys and 21 girls, served as subjects. Ten specific questions were formulated to guide the examination of interrelationships among the test scores.

It was concluded that cognitive style tests can provide useful information to a reading teacher. Also the role which cognitive style variables play in terms of current conceptual and theoretical models of reading comprehension processed should continue to be examined.

Smith, R. J. *The effects of reading a short story for a creative purpose on student attitudes and writing*. Technical Report No. 28. (Ph.D. dissertation) (Out of print) 29 pp. July 1967. ED 017 437.

Twelfth graders in college preparatory English class completed either creative or non-creative writing tasks and responded to an inventory of attitudes relative to the stories and tasks. Half of the students had previously received training on the two types of writing tasks. The analysis treated attitudes, effects of training, and cognitive level of written product.

Smuckler, N. S. *Concept formation as a function of method of presentation and ratio of positive to negative instances*. Technical Report No. 27. (Master's thesis) 24 pp. June 1967. ED 015 779.

The effect of two methods of presentation (simultaneous and successive) and four ratios of positive and negative instances (100 percent, 75 percent, 50 percent, and 25 percent positive instances) upon concept acquisition, transfer, and retention were investigated with 80 second graders.

Sorenson, J. S., Schwenn, E. A., & Bavry, J. L. *The use of individual and group goal-setting conferences as a motivational device to improve student conduct and increase student self-direction: A preliminary study*. Technical Report No. 123. Out of print. 18 pp. March 1970. ED 039 621.

The purpose of this study was to describe the implementation of a school-wide system of individually guided motivation utilizing individual and group goal-setting conferences.

Before they were assigned to treatment groups, all students completed a self-assessment form on which they rated themselves on a set of 20 behaviors. Teachers from each unit, using a consensus method, also evaluated each student on the same set of 20 behaviors.

The principal and unit leaders indicated that they considered the conferences to be highly effective motivational devices.

Sowder, L. *Discovery learning: A status study, Grades 4-7, and an examination of the influence of verbalizing mode on retention*. Technical Report No. 99. (Ph.D. dissertation) 140 pp. July 1969. ED 035 593.

Aims of this study were twofold: (1) to explore the ability of pupils to give operational evidence of generalizing in selected numerical situations, and (2) to study the effects of differing manners of verbalizing a generalization on the retention of the ability to use the generalizations.

Stallard, C. *Effect of selected prereading skills on subsequent reading achievement*. Technical Report No. 392. (Ph.D. dissertation) 5.1.20.40.04.01.02. 215 pp. August 1976.

This study was designed to investigate the effect of mastery of three prereading skills--letter order, letter orientation and word detail--on subsequent first grade reading achievement.

Each of the 35 twenty minute skill lessons was administered on a daily basis by individual classroom teachers from September 29 to November 17, 1975 to a group of 1,068 students from 42 randomly selected classrooms in 20 elementary schools in Fort Worth, Texas.

Results indicated that a statistically significant difference existed (1) between the reading achievement scores of students who began first grade with a mastery of the skills and students who did not and

(2) between students who attained mastery by November and students who did not. Children who first demonstrated performances of mastery in March outperformed students who never demonstrated mastery but differences in the performances between the groups were not statistically significant. While the number of students in Treatment groups who changed from non-mastery to mastery was significantly greater than the number of students who changed in Control groups, training using geometric forms/outline figures or letter/word stimuli did not differ in impact on mastery of the skills. On the basis of the results of this study, it was concluded that mastery of the three selected skills positively affects first grade reading achievement and that instruction in these skills appears to be worthwhile.

Sweet, R. C. Educational attainment and attitudes toward school as a function of feedback in the form of teachers' written comments. Technical Report No. 15. (Master's thesis) 12 pp. November 1966. ED 015 163.

The relationship between a teacher's written comments on a test and subsequent student attainment as measured by test performance has been partially established. This study further clarifies the relationship and examines attitude change toward a school subject as a function of the teacher's comments.

Tatham, S. M. Reading comprehension of materials written with select oral language patterns: A study at grades 2 and 4. Technical Report No. 86. (Ph.D. dissertation) 143 pp. July 1969. ED 036 405.

Two reading comprehension tests were devised to determine whether or not second and fourth graders comprehend material written with oral language patterns that appear frequently in their speech better than material written with patterns that appear infrequently.

Ting, A., Venezky, R. L., Chapman, R. S., & Calfee, R. C. Phonetic transcription: A study of transcriber variation. Technical Report No. 122. 18 pp. March 1970. ED 038 646.

This study examined variation in transcriber disagreement as a function of transcriber's linguistic background, the transcription task, and the nature of judgment involved. Three linguistics students trained in phonetic transcription, one a non-native speaker of English, listened to the same tapes of midwestern kindergartners pronouncing lists of common words.

The judgment of whether or not a sound in a word was mispronounced produced only half as many disagreements as the selection of a particular transcription for a sound thought to be in error by both transcribers.

Towson, S. M. Tutor role enactment in the peer teaching dyad: The effects of tutor-initiated tutee evaluation and reward. Technical Report No. 218. (Master's thesis) 37 pp. March 1972. ED 065 491.

Forty-eight fifth grade, third grade same-sex pairs, half male and half female, met for five one-hour tutoring sessions on reading skills. Pairs were evenly divided among three conditions: (1) Evaluation-Reward, (2) Evaluation-No Reward, and (3) No Evaluation-No Reward.

Planned comparisons of pre- and post-experimental data indicated that tutors in the Evaluation-Reward condition were significantly less satisfied with tutoring than were tutors in the other two conditions. It was hypothesized that these results were due to the reluctance of the tutors to assume the dual responsibilities of both evaluating and rewarding their tutees.

Venezky, R. L. Letter naming and learning to read. Theoretical Paper No. 31. 14 pp. October 1971. ED 058 006.

For about 2,000 years educators assumed without question that learning the letter names in their proper sequence was a prerequisite for literacy. Learning the ABC's became synonymous with learning to read. But today there is disagreement over the value of early letter-name training. Some claim that it aids letter or word discrimination; some claim that it aids attaching sounds to letters; and some claim that it interferes with both of these tasks. The purpose of this paper is to review this controversy through an analysis of the letter names, their application to the teaching of reading, and the experimental data offered for each viewpoint.

Venezky, R. L. The letter-sound generalizations of first, second, and third grade Finnish children. Technical Report No. 219. 9 pp. March 1972. ED 070 066.

The general problem addressed concerns formative evaluation relevant to curriculum development. More specifically, the process of measuring as it relates to primary students was considered. This was narrowed to examining the interaction of two treatments on measuring area with various levels of aptitude. The research strategy was that of an aptitude-treatment interaction (ATI) study. The specific question asked was: In what manner does the ability of children to learn concepts associated with a unit of length affect the extent to which they attain concepts associated with area and a unit of area for each of the two given treatments?

Both treatments had the same behavioral objectives, the same teacher, the same duration (9 days) and the same mode of instruction. They differed in their treatment of the unit of measure for area. After the treatments, three measures--achievement, transfer, and retention--were taken. These measures were used to test hypotheses about the interaction of aptitude with treatments and about the main effects of aptitude and of treatment.

No significant interactions were found between the aptitudes and treatments on any of the measures. There were significant main effects due to aptitude and to treatment for achievement and retention measures.

Venezky, R. L. Letter-sound generalizations as predictors of reading ability in Israeli children. Technical Report No. 247. 9 pp. January 1973. ED 082 144

Earlier research on American English and on Finnish showed only moderately high correlations between letter-sound ability and general reading ability. The present study investigated this relationship in Israeli Hebrew and explored the value of letter-sound ability as a predictor of later reading success.

Subjects were 130 children in primary classes in two Israeli public schools differentiated by SES. Stimuli were 31 synthetic Hebrew words. Each child was tested individually on his reading of the list of words. One year later a standardized reading test was administered to all the subjects.

The results showed a significantly high correlation of letter-sound ability with later reading success for middle SES children first tested in grade 1, but insignificant correlations for middle SES children thereafter. In the lower SES school, the highest correlation was achieved in grade 2, indicating a one-year lag behind the middle SES school.

Letter-sound ability appears to be a good predictor of later reading success when children have just mastered the basic mechanics of the reading process; however, when this beginning phase is ended, the predictive power of letter-sound ability decreases, probably due to increased importance of syntactic/semantic context and whole-word recognition which letter-sound ability aids in developing.

Venezky, R. L. Reading assessment and instructional decision making. Technical Report No. 284. 5.1.20.45.01.04.01. 26 pp. January 1974.

Assessment in reading--especially assessment through standardized tests--has been a topic of continual debate for over 40 years. Nearly every aspect of testing has been the center of controversy--the selection of tests, the appropriateness of particular tests to different cultural groups, interpretation and distribution of test scores, relationship of testing to instruction, and so on. To aid administrators and teachers in designing assessments which are appropriate for their instructional programs, ten principles or "canons" are offered, all deriving from the basic principle (Canon 1) that the function of assessment in reading is to aid in instructional decision making. Other canons deal with the value, content, and exactness of assessment, the design of assessment for program outcomes, and the form and distribution of assessment results.

Venezky, R. L. The prereading skills of Israeli kindergartners. Technical Report No. 332. 5.1.20.45.01.01.03. 21 pp. June 1975. ED 113 699.

Tests for prereading skills of Israeli kindergartners were developed and tested on a wide range of socioeconomic levels. The major goal of this work is to compare deficit patterns and learning rates in prereading skills between the United States and Israel in an attempt to determine which initial reading problems in the United States are unique to the English language and its orthography and to American cultural and educational patterns, and which may be more general.

Based on studies in the United States and Israel, tests were developed for letter matching, rhyming, sound matching, and letter recognition. A second set of tests was then developed, based on the most reliable items from the first set of tests. These tests included rhyming, sound matching, letter order, and word detail. Finally, a test was developed for assessing knowledge of prepositions at the kindergarten level and administered with children from four SES levels. Differences in test scores were found between the three highest groups and the lowest group, but problems were also revealed in the test itself.

Venezky, R. L. A history of research on reading. Theoretical Paper No. 56. 5.1.20.45.01.04.02. 30 pp. October 1975. ED 116 157.

The systematic study of reading dates from the beginnings of experimental psychology in the late nineteenth century. Cattell measured reaction times for naming letters and words, investigated parallel processing, and compared legibilities of letters and printing types. From the end of the 1880's to the publication of Huey's 1908 text, reading processes were a central focus of experimental psychology. Cues for letter and word recognition, and eye-voice span, the nature of comprehension, and subvocalization were among the topics investigated.

After this period, however, the influence of behaviorism turned experimental psychologists away from the investigation of mental processes, while educational psychologists became preoccupied with testing and measurement.

A revival of experimental work occurred in the late 1950's, prompted both by governmental concern for the quality of education, and by experimental psychology's renewed interest in mental processes. With the current rise in popularity of information processing, studies of reading once again occupy a central role in psychology.

Venezky, R. L. Reading acquisition: The occult and the obscure. Theoretical Paper No. 63. 5.1.20.45.01.04.03. 23 pp. March 1976.

Although reading is often viewed as a mysterious process, sufficient evidence is available to identify certain areas as promising for further research and others as unpromising. In applied research, the study of how reading programs are implemented in schools, including leadership roles, teacher attitudes, teacher training, and diagnosis may yield crucial information on why certain schools succeed in teaching reading and others do not. In theory based research, the study of visual word recognition and especially of the role of orthographic structure in this process has already yielded interesting results. A fundamental understanding of word recognition is required not only for its relation to early reading instruction, but also for its relation to comprehension. Among the areas in which further research is not needed are instructional methodologies, modified alphabets, and eye movements.

Venezky, R., Bernard, L., Chicone, S., & Leslie, R. On-line diagnosis of reading difficulties. Technical Report No. 327. 5.1.20.45.01.07.06. 28 pp. February 1975. ED 106 765.

To individualize instruction in reading, a teacher needs diagnoses of each child's strengths and weaknesses. Obtaining this information, however, using only traditional diagnostic tools, is particularly difficult and time-consuming because of the variety and complexity of the skills involved. This paper proposes the use of PLATO, a computer-aided instruction system, for rapid diagnosis of reading skills.

Determining the computer system's validity as a testing instrument was a necessary first step. Therefore a study was conducted to compare the performance of children taking a reading comprehension test on PLATO to that of children taking the same test with paper and pencil. The results showed that with proper response procedures children performed comparably in the two testing situations. This report describes the details of the study and includes a brief outline of future plans to develop a total on-line diagnostic system.

Venezky, R. L., Chapman, R. S., & Calfee, R. C. The development of letter-sound generalizations from second through sixth grade. Technical Report No. 231. 21 pp. September 1972. ED 073 443.

The concern of this study was to determine the development of four specific letter-sound patterns from second through sixth grade: invariant consonants, long and short vowels, c, and g. A 69-item list of synthetic words was prepared and presented to second, fourth, and sixth grade Ss in one of two random orders. Separate analyses of variance were run on each of the four pattern categories.

The results showed that although ability to generalize each of the four patterns increased from second through sixth grade, there were striking differences in the acquisitions of the patterns. At the second and, to a lesser degree, the fourth grade levels, there was little difference between the best and worst readers in ability to generalize invariant consonant correspondences when the letters (e.g., b, m, n) occurred in initial position, but large differences were evident for medial and final position, with the poorer readers showing the least ability.

Long- and short-vowel correspondences were acquired at nearly equal rates, with the differences between quartiles (for reading ability) being considerably less marked than in the responses to invariant consonants.

For the c patterns, which are theoretically more predictable than the vowel patterns, learning of the correct pronunciation for c before e, i, or y occurred extremely slowly and failed to reach 60 percent correct by sixth grade. For all other environments, however, generalization of the correct response started at approximately 73 percent correct in second grade and reached 88 percent correct by sixth grade. For the g patterns, the percentage correct for g before e, i, or y reached only about 35 percent by sixth grade.

Venezky, R. L., Chicone, S., & Perry, J. On-line diagnosis of reading difficulties--II. Technical Report No. 386. 5.1.20.45.01.07.03. In press.

Venezky, R. L., & Shiloah, Y. Visual scanning habits of Israeli kindergartners. Technical Report No. 363. 5.1.20.45.01.01.02. 13 pp. December 1975.

A series of visual scanning studies was done with Israeli preschoolers and kindergartners to resolve several issues related to the design of diagnostic tests and instructional materials. In the first study the effect of item content on error rate was assessed by giving each of 38 kindergartners three multiple-choice tests which differed only in item content (Hebrew letters, familiar pictures, and geometric forms). No item content effect was found either by an analysis of variance, or by test correlations.

In the second study, the scanning preferences of 80 preschoolers and kindergartners were assessed by a picture naming task. Ss were asked to name pictures arranged in horizontal groups of three. A significant increase in both uniformity (consistent left-to-right or right-to-left naming) and in right-to-left scanning was found between nursery and preschool Ss, but not between preschoolers and kindergartners. Preschoolers showed low uniformity and no clear directional preference.

In the third study, directional preferences for visual scanning were explored through a multiple choice format with two correct alternatives. Each of 80 Ss received two versions of each test: one with the target to the left of a horizontal row of alternatives and one with the target to the right. The alternative closest to the target was preferred consistently, thus showing that target position is the major determinant of scanning direction in such formats.

In a fourth study, the effect of target position on order reversal errors was explored, using the letter matching test from the first study. Thirty-five kindergartners received the test in two formats: target to the left of horizontally arranged alternatives and target to the right. No significant difference was found in reversal errors for the two target positions.

Venezky, R., Shiloah, Y., & Calfee, R. Studies of prereading skills in Israel. Technical Report No. 227. 41 pp. June 1972. ED 070 069.

The four studies described here were designed and carried out during the 1970-71 school year as a cooperative project of Tel Aviv University, the University of Wisconsin, and Stanford University. Ss for the studies were drawn from kindergartens and first grades in predominantly lower and lower-middle SES areas (Petah Tikvak, Amishav), with a high proportion of the parents being immigrants from the Oriental countries, Yemen, Iraq, and North Africa.

The first study was the development of a prereading skills test, consisting of separate subtests for picture vocabulary, word memory span, letter and letter-string matching, alphabet recognition and production, and rhyming. This test was administered to four kindergartens in both the fall and spring of 1970-71, and to the first grades in the fall. Reading scores on two different reading tests were obtained in the spring for these same first graders.

The second study was a test of different instructional procedures for teaching picture-sound associations using Hebrew speech sounds as responses, and the third and fourth studies explored sound matching and syllable blending. The results of these studies are reported here, along with plans for the 1971-72 year.

Weinstein, M. S. Effects of training on the concepts of water level and horizontality in the classroom. Technical Report No. 128. (Ph.D. dissertation) 83 pp. May 1970. ED 056 882.

The concepts of water level and horizontality are essential to the coordinatization of the plane. A sequence of training tasks was given to kindergarten, first, and second graders in a design involving pretest, posttest, and a nonequivalent control group. Results showed treatment effects to be significant but there was little differentiation between the two treatments, one of which used specific language labels, and the other generalized everyday language. All grades showed significant gains, but a definite grade effect was shown.

Weissglass, R. R. The effect of memory span on cue patterns in word recognition. Technical Report No. 16. (Master's thesis) 16 pp. December 1966. ED 015 111.

The possible effect of memory span on the cue patterns of young children and the effectiveness of memory span tests as predictors of difficulty in learning to read are reported. Kindergarten children, screened by scores on the WISC Digit Span subtest, selected from a group of five-letter nonsense words the one most similar to a word just shown them. Analysis treated all five position cues.

Whitaker, D. R. A study of the relationships between selected noncognitive factors and the problem solving performance of fourth grade children. Technical Report No. 396. (Ph.D. dissertation) 5.1.20.50.07.01.03. 311 pp. September 1976.

The purpose of this study was to investigate the relationships between the mathematical problem solving performance of fourth grade children, their attitudes toward mathematical problem solving, their teachers' attitudes toward mathematical problem solving, and related sex and program-type differences.

Data were gathered from 15 classes using Developing Mathematical Processes (DMP) and 15 classes using a standard mathematics textbook series.

Both students and teachers possessed favorable mathematical problem solving attitudes. The DMP students performed significantly better than non-DMP students on the first two parts of the problem solving test; no significant differences in performance were observed on the third part. Rather stable and significant positive correlations were found between student problem solving performance and student problem solving attitude.

Significant negative correlations found between DMP teacher problem solving attitude and mean student performance were judged an artifact of the non-random sampling of classes for the study. No significant sex-related differences were found in any of the data.

White, S. Validation of the effectiveness of the learning center approach to skill instruction. Technical Report No. 384. 5.1.20.40.02.01.03. In press.

The Wisconsin Design for Reading Skill Development (the Design) is based on the assumption that individualized reading can become a reality if instruction is focused and differentiated. The Design provides the skills and objectives that focus instruction. Alternative methods for facilitating mastery of these skills must be provided if instruction is to become differentiated. The purpose of this study was to determine the effectiveness of the learning center approach as a possible alternative method for skill instruction of one skill from the Study Skills element of the Design. The hypothesis was: There will be no significant difference between the posttest scores of students in a teacher-directed group and the posttest scores of students in a learning center group.

Following testing and analysis, the investigator concluded, even though there were many variables that could not be controlled, that the learning center could be offered as an alternative approach to instruction of Skill 1 of the Representation Strand of the Study Skills element of the Design.

Wiles, C. A. Comparison of three instructional sequences for the addition and subtraction algorithms. Technical Report No. 273. (Ph.D. dissertation) 5.1.20.50.02.01.06. 265 pp. August 1973.

The purpose of this study was to investigate the differential effects on the achievement of second grade Ss that could be attributed to three instructional sequences for the learning of the addition and subtraction algorithms. The three sequences were designed so that one presented the addition algorithm first (AS), the second presented the subtraction algorithm first (SA), and the third was an integrated presentation of the two algorithms (I).

The findings were that sequence I was not as productive as sequence AS, but was somewhat more productive than sequence SA. Therefore, this study provides evidence counter to that of other studies which indicate that integrating tasks for instruction is more effective. Finally, this study relates to the sequencing of behaviors for instruction and the learning of complex procedural chains.

Wiles, C. A. Computational proficiency and algorithmic learning of sixth graders using DMP materials: A formative evaluation. Technical Report No. 401. 5.1.20.50.02.01.01. 84 pp. October 1976.

This study was an investigation of two questions: (1) How did the computational proficiency of a group of sixth grade children who had one year's experience with Developing Mathematical Processes (DMP) materials compare with that of an equivalent group of students who continued with the usual textbook program? (2) What occurs when sixth grade children study algorithms as sequences of rule statements?

The first question was approached in the following way. A random one third of a group of 90 sixth graders experienced one year of DMP developmental materials. Toward the end of the school year, the whole number computational speed and power of all of the children was measured. Though the magnitudes of the differences favored the DMP group for 6 of the 10 measures, multivariate and univariate analyses failed to show significant differences at the .05 level. In brief, the computational proficiency scores of the children using the DMP materials were as high if not higher than those of their peers who had used the more usual textbook program.

The second question, loosely related to the first, was investigated in the following way. The DMP group and a selected subgroup of the remaining population spent the last two full weeks of the school year working with a special unit. This unit required children to verbally analyze algorithms they knew how to do. While it was anticipated that there may be differences between the DMP and non-DMP groups in their ability to complete these tasks, the data were inadequate to resolve this question.

Students in general were willing to attempt the tasks and they experienced some success in doing them. While no conclusions regarding the appropriateness of the verbal analysis of algorithms were presented, the general course of the unit was encouraging for further investigation. Perhaps the most interesting outcomes were the questions which emerged. These involve the identification and characterization of irreducible components of children's algorithmic thinking as well as the language they use to connect such components.

Wiles, C. A., Romberg, T. A., & Moser, J. A. The relative effectiveness of two different instructional sequences designed to teach the addition and subtraction algorithms. Technical Report No. 222. 49 pp. June 1972. ED 070 663.

Two sequences of activities were developed to provide instruction in using the algorithms for addition and subtraction of two-digit numbers. In the integrated sequence (I) the mechanics of "carrying" and "borrowing" were treated as a single process "regrouping." In the sequential treatment (S) the addition algorithm was developed before the subtraction algorithm.

Overall differences in group performance, though favoring group S, were not statistically significant. Some differences in performance on operations at specific times were significant and favored group S. Learning profiles of performance across time indicated addition scores were significantly higher than subtraction scores for both groups and also indicated significant linear trends for both operations while no higher order trends were evident.

Wilkes, R. Peer and cross-age tutoring and related topics: An annotated bibliography. Theoretical Paper No. 53. 5.1.20.30.06.01.01. 71 pp. May 1975. ED 114 372.

Educational, social, and health institutions are increasingly using peer resources in a variety of settings. In education, this movement is seen in the growing use of peer tutoring (students teaching others of the same age or grade), cross-age tutoring (older students teaching younger ones), and "team" learning (students paired for mutual help). At the same time, researchers are investigating the nature and effects of such interactions and, specifically, the benefits of tutoring for both the tutor and the tutee.

This bibliography is an effort to provide educators and researchers with a comprehensive listing of current resources, information, and research concerning academic tutoring by students, together with a selection of references on related topics, such as the use of paraprofessionals. The references cited were selected from a search of educational and psychological literature from 1960 to 1973. Included are descriptions of both informal tutoring programs in individual classrooms and organized, systematic programs developed and formally evaluated by educators. The bibliography also contains reports on a number of controlled experiments and doctoral theses investigating the effectiveness of tutoring by children and adults and the significance of such factors as race, age, and sex differences in tutoring combinations.

Zalewski, D. L. An exploratory study to compare two performance measures: An interview-coding scheme of mathematical problem solving and a written test. Technical Report No. 306. (Ph.D. dissertation) 5.1.20.50.06.01.01. 205 pp. in two parts. August 1974. Part 1: ED 101 718; Part 2: ED 101 719.

This study explored the feasibility of using a written test to predict seventh graders' mathematical problem-solving achievement as assessed by an interview-coding procedure. A search revealed that most mathematical assessment procedures are commercial tests which do not offer any definitions and which usually require simple applications or algorithmic situations, and therefore do not satisfy the criteria established in this study. A thinking-aloud procedure was used for validly assessing Ss' mathematical problem-solving achievement. Interviews yielded audio- and video-taped protocols, and a coding system permitted classification, analysis, and scoring of the Ss' performances.

Two 2-item written instruments were developed to be used as a valid alternative to the interview and coding procedure. Three rankings were developed from the interview test and one ranking was developed from each written test. The correlation coefficients between the written and interview test scores did not reach the .71 level established for feasibility. One coefficient reached .68 and the tests shared high rank order agreement. These results suggested that a more reliable test might attain the .71 correlation. Clustering and multidimensional scaling verified the structure imposed by the total score ranks.

ORGANIZATION FOR INSTRUCTION AND ADMINISTRATIVE ARRANGEMENTS
5.1.30

Organizational-Individual Articulation Within Multiunit Schools

Axiomatic Organizational Processes in Multiunit School Districts

Cost-Effectiveness and Productivity

Role of the Specialist Teacher in the Multiunit School

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TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Bocian, B. H. Effectiveness of the multiunit elementary school's instruction and research unit and student affective behavior in IGE schools. Technical Report No. 389. (Ph.D. dissertation) 5.1.30.20.02.01.02. 100 pp. July 1976.

The purpose of this study was to determine the degree of relationship between the effectiveness of the I & R unit in the areas of (1) instructional program (reading and mathematics), (2) organizational operations (procedural and substantive), (3) school-community relations, and (4) staff development to several measures of student affective behavior in IGE schools. The framework for the study was that of general systems theory, social systems theory, and self concept theory.

Among the major conclusions were (1) There is no significant multiple correlation between any of the independent variables and (student) self security, social maturity, social confidence, school affiliation, and peer affiliation; and (2) There is no significant relationship between I & R unit total effectiveness and any of the measures of student affective behavior.

Evers, N. A. An analysis of the relationship between the effectiveness of the multiunit elementary school's Instruction and Research unit and interpersonal behaviors. Technical Report No. 298. (Ph.D. dissertation) 5.1.30.20.01.01.07. 187 pp. May 1974.

The purpose of this study was to test the following major hypothesis: There is no significant relationship between I & R unit effectiveness and the interrelationships of (1) I & R unit member compatibility, (2) the unit leader's Instrumental Leadership behavior, Supportive Leadership behavior, and Participative Leadership behavior, and (3) the level of task structure perceived by I & R unit members. Several ancillary hypotheses were also tested.

Data were collected from 163 I & R units from 45 multiunit elementary schools in 12 different states. A five part instrument was developed and adapted for this study. Seven major conclusions resulted.

Goodridge, C. G. Factors that influence the decision to adopt an educational innovation: IGE. Technical Report No. 376. (Ph.D. dissertation) 5.1.30.20.01.01.09. 172 pp. in 2 parts. December 1975.

This study focused on the identification of those people who made the final decision to adopt Individually Guided Education (IGE), and factors that influenced that decision.

Among the major conclusions it was found that (1) principals were the major decision makers concerning the decision to adopt IGE; (2) individualization of instruction, related to the IGE program, was the major reason for the adoption of IGE; (3) prestige, keeping up with current trends, or an accompanying gain in funding were important reasons for the adoption of IGE; (4) the most influential and successful external change agents were teachers from other IGE schools who were viewed as credible; and (5) in none of the cases was decision making shared among board members, superintendents, principal, staff, and parents. When decision making was shared, it was between no more than two levels in the organization.

It is suggested that the study be replicated in a larger sample of schools and suggestions are made concerning research in the field of change agent effectiveness, decentralized decision making, and information search as part of the decision process.

Gramenz, G. W. Relationship of principal leader behavior and organizational structure of the IGE/MUS-E to I and R unit effectiveness. Technical Report No. 320. (Ph.D. dissertation) 5.1.30.20.01.01.06. 164 pp. September 1974.

This study was designed to investigate the interrelationships between the leader behavior of IGE/MUS-E principals, the organizational structure of IGE/MUS-Es as measured by their degrees of centralization, formalization, and stratification, and the effectiveness of the I & R units. In addition, five ancillary questions were posed which dealt, respectively, with differences between the perceptions of principals, unit leaders, and unit teachers with regard to the real and ideal behavior of principals, the organizational structure dimensions, and I & R unit effectiveness; and the relationship between school size (number of students) and the independent and dependent variables.

Herrick, H. S. The relationship of organizational structure of teacher motivation in multiunit and nonmultiunit elementary schools. Technical Report No. 322. (Ph.D. dissertation) 5.1.30.20.01.01.13. 135 pp. October 1974. ED 101 442.

This study was designed to examine the relationship of organizational variables to teacher motivation to perform. It also sought to determine what differences, if any, existed between the organizational structures of multiunit (MUS) and nonmultiunit IGE elementary schools.

Based on the results of this study, it is suggested that administrators interested in developing higher levels of teacher motivation make every effort to involve teachers in the decision-making process and that they attempt to distribute rewards to teachers fairly and justly. Further research also should be conducted concerning the relationship of organizational structure variables to motivation and role performance.

Holmquist, A. M. A definitional field study of decision making in IGE/MUS-E schools. Technical Report No. 377. (Ph.D. dissertation) 5.1.30.20.01.01.08. 134 pp. June 1976.

The purpose of this study was to investigate and describe decision making in IGE schools. Concepts from four selected conceptual frameworks--rational decision process, organizational structure, individual traits and values, and group interaction--were set forth as guidelines for observations. Specific questions addressed in the study were: (1) How well do existent conceptual models explain decision making in IGE schools? (2) Can a new model be developed which augments extant conceptual models of decision making? (3) What are the variables which define decision making in IGE schools? (4) What are the interrelationships of the variables which define decision making in IGE schools? (5) What hypotheses can be generated from a new model? and (6) How does the new model developed from the interrelationships of variables explain decision making in IGE schools?

A new model of decision making, which emerged from the data, was used to examine the decision-making processes observed in the three schools. It was compared and contrasted with existing theories of decision making and some modifications of these theories were suggested.

Howes, N. J. Change factors related to the institutionalization of the multiunit elementary school. Technical Report No 319. (Ph.D. dissertation) 5.1.30.20.01.01.03. 311 pp. September 1974. ED 101 465.

The purpose of this study was to: (1) identify some of the variables and critical clusters of variables of change related to the institutionalization of the organizational component of the multiunit elementary school

(MUS-E) and (2) begin to identify some of the elements of change implicitly involved in the successful institutionalization of educational change in general. Five descriptive organizational change questionnaires were designed and distributed to a selected national sample of over 2,000 unit teachers, unit leaders, principals, district coordinators, and superintendents in multiunit schools and school districts.

The variables of change which directly related to the institutionalization of MUS-E were (1) the perceived relative advantage, observability, and simplicity of MUS-E; (2) the degree to which the individual was informed, involved, and supported in the change process; (3) the way and degree to which the individual communicated with others; and (4) the way and degree to which the school organization was complex and less formalized. Three major conclusions were developed from these findings; all of them describing a model for looking at change.

Katzenmeyer, C. G., Ingison, L. J., Zajano, N., & Romaniuk, J. Evaluating IGE: An initial literature review and exploratory study. Technical Report No. 404. 5.1.30.60.01.01. 179 pp. November 1976.

This report presents the results of an initial evaluation study of Individually Guided Education (IGE). A matched sample of IGE and non-IGE schools was compared on a variety of direct and indirect outcome measures. Findings indicated general support for the achievement of direct outcomes, with few differences between IGE and control schools shown on indirect outcome measures. Conclusions and recommendations are directed both toward further evaluation efforts as well as to identifying issues in furthering research and development on IGE.

Kim, J. E., Fruth, M. J., & Bowles, B. D. Home-school-community relations: The state of the art. Theoretical Paper No. 61. 5.1.30.50.01.01.01. 75 pp. December 1976.

"The State of the Art" is a bibliographical essay current to 1975 consisting of 300 items relating to home-school-community relations. This literature was examined in order to (1) provide a conceptual framework for home-school-community relations, (2) develop a classification scheme for existing theory and practice, and (3) suggest further research in home-school-community relations. The literature of home-school-community relations suggests three distinct conceptual classifications: (1) home-school-community relations as an administrative function, (2) home-school-community relations as public participation, and (3) home-school-community relations as a political process. Each of these typologies is described in terms of objectives, programs and activities, underlying theoretical foundations, and the results of related research. The literature review concludes with a set of implications for model building, research, the improvement of home-school-community relations programs and practices, and the development of teacher/administrator training programs for home-school-community relations.

Klausmeier, H. J., Quilling, M. R., & Sorenson, J. S. The development and evaluation of the multiunit elementary school, 1966-1970. Technical Report No. 158. 16 pp. March 1971. ED 051 589.

A system of Individually Guided Education (IGE) has been developed at the elementary school level. The IGE system has seven components, one of which is new organizational/administrative arrangements, together called the Multiunit Elementary School (MUS-E). These new arrangements are the Instruction and Research unit at the classroom level (I & R unit), the Instructional Improvement Committee at the building level (IIC), and the System-wide Policy Committee at the system level (SPC). The MUS-E emerged since 1965 from a synthesis of theory and practice regarding instructional programming for the individual student, horizontal and vertical organization for instruction, role differentiation, shared decision making, and open communication.

Since 1965-66, 164 MUS-Es have been formed and there has been continuous evaluation of the effects of IGE. Early evaluation results indicate support of the hypothesis that children in their sixth year of schooling in an IGE/MUS-E school will achieve as high as did children of the same school in seven years prior to adoption of the IGE system.

Klenke, W. H. An exploratory case study of the multiunit school and the Instructional Programing Model: Power, resources, values. Technical Report No. 349. 5.1.30.50.01.02.03. (Master's thesis) 225 pp. August 1975. ED 114 912.

The purpose of this study was to examine the interpretation of the characteristics of the multiunit school and the Instructional Programing Model as they related to home-school-community relations.

This case study was exploratory in design. An open-ended interview schedule was developed to obtain substantive data regarding the operationalization of the multiunit school and the Instructional Programing Model. Interviews were held with principals, unit leaders, teachers, aides, and parents. A data retrieval system, consisting of coded and notched key-sort cards, was devised to code and retrieve the data gathered during the interviews.

Two general conclusions were reached. First, the successful implementation and operationalization of the characteristics of the multiunit school and the Instructional Programing Model depend on the degree to which they provide visible benefits for the community. Second, actual or potential conflict is more likely to result from differing educational values associated with the characteristics than either their allocation of power or resources.

Klenke, W. H., Moser, R., & Fruth, M. Introducing parents to the Wisconsin Reading Design. Simformation 1. 5.1.30.50.02.01.02. 43 pp. May 1975. $2.00.

This guide is designed to assist local schools in their efforts toward inservice activities for parents during the first year implementation of the Wisconsin Design for Reading Skill Development (WDRSD or the Design). It outlines a series of simulation-information (Simformation) activities designed to increase parental understanding of the Design.

This guide presents the sequence of activities, accompanying directions, and printed materials required for conducting the simformation, and appendices containing duplicable materials necessary for use in the simformation activities.

Available through the CCL Document Service.

Krupa, W. E. An analysis of home-school-community relations activities in IGE schools. Technical Report No. 369. (Ph.D. dissertation) 5.1.30.50.01.02.06. 149 pp. May 1976.

The purpose of this study was to examine a number of home-school-community relations activities in IGE schools in order to determine (1) the roles and responsibilities of principals, unit leaders, and teachers in implementing these activities, (2) the objectives of these activities as perceived by IGE school personnel, (3) the focus of the intended interaction between the school and the community, and (4) the perceived importance and effectiveness of the selected activities.

A survey was employed to conduct the study in twenty-six schools located in nine states. It was concluded from the findings of this study that the assumption that IGE schools would automatically evolve different patterns of home-school-community relations based on IGE organizational arrangements was not supported. A need exists for the development of a comprehensive program of home-school-community relations which integrates the objectives, the intended interactions, and the roles and responsibilities of school personnel in home-school-community relations.

Lake, R. V. An analysis of a home-school-community relations program in an IGE school. Technical Report No. 395. 5.1.30.50.01.02.08. 255 pp. August 1976.

The purpose of this study was to conduct an in-depth analysis of a school's home-school-community relations program from the perspective of the school's staff and the citizens within its attendance area. The study was designed to determine the programmatic and nonprogrammatic activities and to examine the existing relationships between (1) the operating functions, (2) the control functions, (3) the primary interaction patterns, and (4) the importance and effectiveness of the activities.

The study was conducted in a single school district using interviews and questionnaires as means of answering fourteen research questions and two ancillary questions developed from the home-school-community relations literature and research.

Several conclusions are discussed along with some implications for further research and practice.

Lins, L. J. Organizational structures and operational practices of selected educational r & d centers and educational laboratories and of selected centers, laboratories, and institutes on one university campus. Technical Report No. 237. 98 pp. September 1972. ED 070 179.

This study notes, and analyzes organizational structures, operational situations, and institutional ties of five selected educational r & d centers and three selected educational laboratories then funded by the U.S. Office of Education, and of 12 selected extramurally funded centers, laboratories, and institutions representing a variety of disciplines on one campus of a major university.

Data, experiences, and judgments were solicited, by interview, from the heads of the various centers, laboratories, and institutes on issues such as funding and effects of funding assurances, administrative arrangements, academic vs. nonacademic organization, staffing, internal communications, and development, dissemination, and implementation of products.

Marinelli, J. J. An analytical process model for cost-effectiveness/productivity evaluations of alternative educational programs. Technical Report No. 390. (Ph.D. dissertation) 5.1.30.30.01.01.02. 420 pp. in 3 parts. July 1976.

The purposes of this study were (1) to ascertain the state of the art with regard to cost-effectiveness and productivity analyses in education and (2) to develop an appropriate cost-effectiveness analytical process model for education.

To specify an analytical process model, the nine major generally recognized steps of cost-effectiveness evaluations were examined. This examination revealed the essential process elements and relationships within, boundaries of, and relationships between each step. Some prescriptive guidelines and references were also provided for potential users of the model.

Steps of the general model were integrated with the conceptual framework of an educational system from a viewpoint of economic analysis.

Miles, W. R. Home-school-community relations as a political process: Four exploratory case studies of the implementation of Individually Guided Education (IGE) and home-school-community relations. Technical Report No. 360. (Ph.D. dissertation) 5.1.30.50.01.02.04. 296 pp. December 1975. ED 120 654.

A review of the literature on community typology, acceptance of change, and school-community relations did not show any pattern of verifiable hypotheses at the elementary school attendance level. For this study, home-school-community relations was defined as the effective (1) resolution of actual or potential conflict in the home-school-community environment, and (2) allocation of scarce economic resources, differing social values, and unequal political power.

The research had four objectives: (1) to describe home-school-community relations in selected IGE schools; (2) to explain the home-school-community relations and the implementation of IGE in political terms using issue analysis and policy acceptance analysis; (3) to generate hypotheses from the data gathered through objectives 1 and 2, and relate them to the

McCarty Ramsey community typology model and the zone of tolerance concept; and (4) to generate practial recommendations for the public school audience.

Nineteen hypotheses were generated from the data. Eleven recommendations were written for the public school audience.

Miles, W. R., Bowles, B. D., & Fruth, M. J. The implementation of IGE and related home-school-community relations programs and activities: Seven case studies. Theoretical Paper No. 64. 5.1.30.50.01.02.01. 95 pp. December 1976.

This paper is composed of seven case studies of home-school-community relations. More specifically, each case describes the school and community, the implementation of IGE programs, and home-school-community relations programs and activities, and analyzes the home-school-community relations programs and activities. The selection of the seven schools was primarily based on the presence of at least one exemplary home-school-community relations program or activity in IGE schools serving communities of varying socio-economic composition. The cases stress home-school-community relations at the school site. The principal methods utilized were open-ended interviews and field observation. The cases provide a rich data base for further conceptual-theoretical analysis as well as practical examples of exemplary home-school-community relations at the school site, particularly in IGE schools.

Nelson, R. G., Junker, L. K., & Fischbach, T. J. Learning climate in IGE/MUS-E schools. Technical Report No. 213 (Revised). 5.1.30.10.10.02.03. 67 pp. October 1975. ED 117 043.

The purpose of this study was to investigate the relationship of the learning climate of pupils to Individually Guided Education (IGE) with its Multiunit Elementary School (MUS-E) organizational structure. IGE/MUS-E, which was developed by the Wisconsin Research and Development Center for Cognitive Learning, is a comprehensive educational system incorporating several innovative educational developments including nongraded multi-aged grouping patterns, shared decision making, differential staffing, a team approach, and an instructional programing model which attempts to provide a program of instruction based on the learning style and needs of each pupil.

The basic question of the study was: Is the IGE/MUS-E organizational structure characterized by a different learning climate than the traditional self-contained organizational structure? To answer this question, five attitudinal variables concerned with learning climate were examined. They were pupil attitude toward himself/herself as a learner, other pupils, teachers, instruction, and school. The instruments employed in the study also permitted the analysis of data concerned with pupils' attitudes toward the school plant, school administration, and the community. Data on attendance and tardiness were also collected.

Analysis of the data produced the following findings: No difference was found between IGE/MUS-E school pupils and the control school pupils on the general measure termed "learning climate." Further analysis, however, showed that in this study pupils in IGE/MUS-E schools scored significantly higher on the measure of "self-concept as learners" and marginally higher on the measure of "attitude toward fellow pupils" than did pupils in control schools.

Nerlinger, C. M. Participative decision making in IGE-MUS-E schools. Technical Report No. 356. 5.1.30.20.01.01.14. (Master's thesis) 163 pp. September 1975. ED 115 583.

The purpose of this study was to examine the relationships of the Instructional Improvement Committee's involvement in decision making, the representation of teachers on the Instructional Improvement Committee (IIC), and the effectiveness of the Instruction and Research (I & R) Unit in Individually Guided Education/Multiunit Elementary Schools.

Seven hypotheses were developed to test the relationship of extent of involvement in decision making and representation to effectiveness of the I & R unit as perceived by (1) unit teachers, (2) the unit leader, and (3) both unit teachers and unit leaders. Ancillary questions were posed to compare the perceptions of unit teachers and unit leaders and to examine the relationships of the institutional variables to I & R unit effectiveness.

Paul, D. A. The diffusion of an innovation through interorganizational linkages: A comparative case study. Technical Report No. 308. (Ph.D dissertation) 5.1.30.20.01.01.04. 402 pp. July 1974. ED 098 236.

The diffusion of IGE/MUS from its source, the R & D Center, to its final destination, the local schools, was explored in terms of the complex organizational relationships and roles between and among the R & D Center, resource system, state education agencies (SEA), and teacher education institutions (TEI), both mediating systems, and local schools (LEA), user system. A semi-structured interview schedule was used to collect data from system representatives in three states and to probe for relationships, unanticipated barriers, and concerns associated with the dependent variable, diffusion.

A number of implications for future research resulted from the findings: (1) expansion of the dependent variable of diffusion to incorporate the new role expectations of the staff, (2) inclusion of quality measures for the independent variable of linkage, (3) revision of the independent variables of structure and capability to account for the linkage relationship, and (4) refinement and verification of the propositions derived from the study.

Sheridan, T. J. Perceived role and effectiveness of the unit leader in conducting unit functions. Technical Report No. 318. (Ph.D. dissertation) 5.1.30.20.01.01.02. 221 pp. September 1974. ED 101 443.

The system of Individually Guided Education in the Multiunit Elementary School organizes the school into Instruction and Research Units headed by a new role--that of unit leader. This study determined the extent of agreement among and between principals, teachers, and unit leaders regarding expectations held for the unit leader role: examined the relationship between referent group agreement and performance effectiveness ratings; and investigated the relationship between selected organizational variables and agreement on role expectations.

Sigurdson, C. W. Effectiveness of the instruction and research unit and student achievement in IGE schools. Technical Report No. 385. (Ph.D. dissertation) 5.1.30.20.02.01. 142 pp. June 1976.

The purpose of this study was to ascertain the extent to which organizational aspects of Individually Guided Education schools relate to cognitive achievement of students in those schools. Effectiveness of the I & R unit was measured by the I & R Unit Operations Questionnaire whereby teachers report perceptions of how well their unit accomplishes the institutional expectations or specifically, the performance objectives set for their unit. Student achievement in reading and mathematics was measured by a standardized test battery, the Comprehensive Tests of Basic Skills, Form S.

In general, staff members perceived their I & R unit as being effective. The achievement levels of students in IGE schools in both reading and mathematics compared favorably with the national norms. The correlational statistics revealed that there was no statistical significance between I & R unit effectiveness and student achievement in reading and mathematics.

Based upon the findings of this study, it is not possible to state empirically that there is any relationship between the effectiveness of the I & R unit and student achievement in that unit.

Suggestions were offered for further definitive research in this domain.

Smith, K. B. An analysis of the relationship between effectiveness of the multiunit elementary school's Instructional Improvement Committee and interpersonal and leader behaviors. Technical Report No. 230. (Ph.D. dissertation) 141 pp. September 1972. ED 046 505.

The purpose of this study was to determine those variables which associate with operationally effective Instructional Improvement Committees (IIC) in multiunit schools. The major hypothesis of the study stated: There is no significant multiple correlation between IIC effectiveness and the interrelationship between the IIC chairman's leader Initiation of Structure and Consideration behavior and IIC chairman-IIC member compatibility.

The tests of the assumed correlations revealed IIC effectiveness to be significantly related to an IIC's involvement in its prescribed tasks. The effectiveness of an IIC was found not to be related significantly to IIC member attendance at R & D Center supported workshops, the IIC chairman's administrative experience, or the amount of time the IIC spent meeting each month when the variable was considered separately.

Venezky, R. L. Designing schools to meet modern educational practices. Technical Report No. 391. 5.1.30.10.10.02. In press.

Wright, K. W. Real and ideal decision structure and involvement in IGE schools. Technical Report No. 374. (Ph.D. dissertation) 5.1.30.20.01.01.05. 136 pp. June 1976. ED 126 562.

The purpose of this study was to develop valid and reliable instrumentation to measure the perceptions of teachers regarding the structures for making decisions and the level of involvement of teachers in making potent decisions in IGE schools.

The theoretical framework for the study was decision theory. Elements of Lipham's model of the decision-making process and of Dale's definition of decentralization of decision making were incorporated into the instrument. In contrast to previous research on decision theory, this study attempted to ground the theoretical framework in observed and reported phenomena as well as to examine relationships with other constructs.

The study was conducted in three phases: (1) the definition phase; (2) the instrument construction phase; and (3) the instrument testing phase. Several major findings are specified.

DEVELOPMENTAL COMPONENTS

DEVELOPING MATHEMATICAL PROCESSES
5.2.23

Associated Faculty:
Thomas A. Romberg, Department of Curriculum and Instruction
John G. Harvey, Department of Mathematics and Department of Curriculum and Instruction
J. Fred Weaver, Department of Curriculum and Instruction

Project Coordinator:
James M. Moser

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Hubbard, W. D. Developing Mathematical Processes: A report of the 1971-72 field test. Technical Report No. 248. 43 pp. December 1972. ED 085 091.

A field test of the first two levels of Developing Mathematical Processes was conducted in eight schools. Four were multiunit schools located in settings ranging from small town to large city; the remaining schools were conventionally organized and located in large urban areas. The purpose of the field test was (a) to determine the effectiveness of the instructional program in terms of student achievement, (b) to gauge the impact of an inservice program on teacher performance, and (c) to document the usability of the program.

The results of the field test indicated a mastery level on the specific objectives of the program within the range of 70% to 80%. In addition there was evidence to support the notion that students enhance their mastery level over time, reaching a mastery level within the range of 78% to 87%. This was clearly true in the first grade, although kindergarten students experienced a slight decline in their mastery level. The data on teacher performance established that the inservice program was a positive influence on the behavior of teachers with the exception of those aspects related to managing the instructional program. Of particular interest is the fact that 80% of the teachers were able to implement the activity approach to teaching/learning that is specified by the developers.

Finally, in regard to the usability of the program, the field test established that teachers will expend the effort to attend frequent inservice meetings, to prepare an appreciable amount of instructional materials, and to plan for the several instructional modes in the program. In addition, it was determined that students will enthusiastically participate in the learning activities, and in fact opt to use them during their elective time. Developing Mathematical Processes was demonstrated to be a viable program for elementary school children at the kindergaten and first grade levels on the basis of the data gathered in the field test.

Hubbard, W. D., & Buchanan, A. E. Developing Mathematical Processes: 1972-73 field test report. Technical Report No. 324. 5.2.23.60.06.01.01. 63 pp. March 1975.

A continuation of the field test of Developing Mathematical Processes was conducted in eight schools. Four were multiunit schools located in settings ranging from small town to large city; the remaining schools were conventionally organized and located in large urban areas. The purpose of the field test was (a) to determine the effectiveness of the instructional program in terms of student achievement, and (b) to document the usability of the program. The second year of the field test focused on the third level of the program.

The results of the field test indicated a mastery level of approximately 81 percent on the specific objectives of the program. Overall performance was retarded by poor results in one topic. On the latter portions of the program, maintenance of the mastery level reached a level of 83 percent. The data on standardized test achievement did not conclusively favor either DMP or its conventional counterparts. When the opportunity for a student to learn tested material was considered in the analysis, DMP students compared favorably to non-DMP students. On the basis of the data gathered in the field test, Developing Mathematical Processes was demonstrated to be a viable program for elementary school children at the second-grade level.

King, I. L. A formative development of a unit on proof for use in the elementry school. Technical Report No. 111. (Ph.D. dissertation) 393 pp. in 3 parts. January 1970. ED 040 876.

To test the feasibility of presenting proof materials to college-capable sixth grade students, a unit on mathematical proof was developed using an iterative procedure. Formative evaluation procedures were used to improve various components of the unit. The iterative developmental procedures employed in developing the unit were highly successful; sixth grade students are able to understand and prove the mathematical proofs as presented in the unit.

Meyer, R. W. The identification and encouragement of mathematical creativity in first grade students. Technical Report No. 112. (Ph.D. dissertation) 236 pp. in 3 parts. January 1970. Part 1: ED 038 292, Part 2: ED 038 293, Part 3: ED 038 294.

One set of conditions conducive to mathematical creativity was proposed and activities which satisfy these conditions were piloted. From these activities both an instructional program to encourage individual mathematical creativity in first grade students and two problems to use as part of the test instrument were developed. An experiment was conducted to determine the effects of participation in the program on observable mathematical creativity. The effects on general creativity were measured using the Torrance Tests of Creative Thinking, Figural Forms A and B. Evidence revealed that under suitable conditions, first grade students can exhibit behaviors satisfying these criteria.

Montgomery, M. E., & Whitaker, D. R. *Report of the coordinators' training for large scale field testing of Developing Mathematical Processes*. Technical Report No. 296. 5.2.23.60.09.01.01. 147 pp. January 1975.

The purpose of this report is to describe the activities conducted during the 1972-73 field test of DMP materials and procedures, and to describe the revisions needed in the implementation projections for coordinators. In addition, it contains a brief summary of the 1973 and 1974 training programs for coordinators and the process of revising the coordinator's manual.

The main revisions suggested by the field test were: (1) coordinators should have materials in plenty of time to become acquainted with them prior to the training session; (2) the training session should be more active and more emphasis needs to be placed on assessment and management procedures; (3) the materials (slide tapes, simulated experiences) projected for use in inservices are badly needed; and (4) coordinators need support throughout the year and a maintenance conference.

Perham, B. H. *A study of multiple relationships among teacher characteristics, teaching behaviors and criterion-referenced student performance in mathematics*. Technical Report No. 286. (Ph.D. dissertation) 5.2.23.60.05.01.02. 72 pp. January 1974.

This study, carried out in connection with the 1971-72 small-scale DMP field test, was an investigation of relationships among the teacher characteristics, teaching behaviors, and criterion-referenced student performance in mathematics.

Twenty-two significant relationships were identified among the dependent variables--teacher characteristics--and the criterion variables--teaching behaviors. Membership in a multiunit school significantly influenced student level of mastery on a DMP criterion-referenced Topic Inventory. The structuring comments of a teacher significantly influenced student level of mastery on Topic Inventory I, Level 1. The verbal behavior of a teacher significantly influenced student level of mastery on Topic Inventory I, Level 1.

Romberg, T. A., Shepler, J., & King, I. *Mastery learning and retention*. Technical Report No. 151. 15 pp. December 1970. ED 046 037.

This paper reports the results of two retention studies. In each study, tests were given some time after instruction to a class of students whose initial level of performance was quite high. For the first study, on retention of probability concepts, the correlation between achievement scores immediately after learning and those obtained four weeks later was .78. For the second study, on recall of mathematical proofs, the correlation between achievement scores immediately after learning and those obtained two weeks later was .75. The results indicate that high initial performance may contribute to high retention.

Shepler, J. L. *An exploratory study of the interaction of three elementary concepts of probability with stimuli, socioeconomic, grade, and IQ differences*. Technical Report No. 114. 45 pp. March 1970. ED 045 414.

This status study provides evidence supporting the feasibility of teaching certain probability concepts to at least 30 fifth and sixth grade students. The study employed an interview technique to analyze the status of three basic concepts of probability (sample space, probability of an event, choosing the most [equally] likely of two events) and measured the effects of visual aids on the child's ability to solve problems involving these concepts.

Shepler, J. L. *A study of parts of the development of a unit in probability and statistics for the elementary school*. Technical Report No. 105. (Ph.D. dissertation) 410 pp. in 4 parts. Out of print. Part 1: ED 038 302, Part 2: ED 038 303, Part 3: ED 038 304, Part 4, ED 038 305.

The behavioral objectives for a unit of instruction in probability and statistics for sixth grade students and the order in which objectives would be taught were determined. An instructional analysis of the unit was undertaken to select or develop materials and procedures for teaching the unit.

Stewart, D. M. *Development of a group test of arithmetic achievement for Developing Mathematical Processes, Arithmetic Book 1*. Technical Report No. 140. (Master's Thesis) August 1970. ED 047 979.

The purpose of this study was to construct a group-administered test of kindergarten and first grade children's knowledge of the content of *Developing Mathematical Processes, Arithmetic Book I*. From the list of behavioral objectives for Book I, 15 were selected as ones whose attainment could be measured in group paper-and-pencil tests. Eight item prototypes were developed from which the 171 items tried out were generated. Items were compiled into seven tests (booklets), each of which was administered to approximately 40 children.

PRE-READING SKILLS PROGRAM
5.2.41

Associated Faculty:
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Project Coordinator:
Susan D. Pittelman

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Alexander, E. M. Task and intra-task differences in vocabulary performance. Technical Report No. 186. (Master's thesis) 76 pp. December 1971. ED 070 063.

Two vocabulary tasks--one production and one recognition--were compared with the expectation that the recognition task would yield better peformance than the production task. The pairs of pictures used in the recognition task were divided into eight groups defined on target and distractor frequency and same-different conceptual category membership with the exception that these groups would differ in relative error rate. Not only was the task difference confirmed, but evidence of considerable variability between test items was found, with a particularly significant effect involving category relationship.

Calfee, R. C., Chapman, R. S., & Venezky, R L. How a child needs to think to learn to read. Technical Report No. 131. 41 pp. July 1970. ED 046 627.

This report summarizes 1968-69 studies of component prereading skills of kindergartners. Working from the assumption that independent component skills might exist, four skill areas were selected for investigation on the basis of literature findings and a decoding model of reading: visual, acoustic-phonetic, letter-sound association, and vocabulary skills. A research strategy is presented for the development and validation of assessment tests in each area and the subsequent development and validation of training procedures. The research reported here is concerned with skill assessment in each of the areas.

Calfee, R. C., & Venezky, R. L. Component skills in beginning reading. Technical Report No. 60. 14 pp. July 1968. ED 064 655.

This paper raises the question: What skills are required by current reading tests? The make up of test items is such that ability to follow instructions and general language competence are common factors which enter significantly into performance on all subtests. The task of constructing tests to identify separable skills in language and intelligence is possible but difficult.

Chapman, R. S. Report on the fall 1970 version of the Wisconsin Basic Prereading Skill Test. Technical Report No. 179. 27 pp. August 1971. ED 065 538.

This report summarizes the findings of a fall 1970 administration of the Wisconsin Basic Prereading Skill Test to 162 entering kindergartners. The test is being developed to diagnose prereading skill deficits in kindergartners and to predict end-of-first-grade reading achievement. Included in the fall administration were subtests for attending to letter order, letter orientation, and letter-string detail, and for segmenting sound sequences. A test for letter-naming ability was included for comparison to previous vesions of the test, but will not be retained in the final version. Results are presented and the implications for test revision discussed.

Chapman, R. S. Report on the February 1971 version of the Wisconsin Basic Prereading Skill Test. Technical Report No. 187. 52 pp. December 1971. ED 069 339.

This report summarizes the findings of a February 1971 administration of a revised and expanded version of the Wisconsin Basic Prereading Skill Test to 138 kindergartners. The test battery has two purposes: (a) identification of prereading skill deficits in kindergartners for individualized curriculum planning, and (b) prediction of reading achievement at the end of first grade.

Included in the February 1971 test battery were visual tests for attending to letter orientation, letter-string order, and letter-string detail; auditory tests for sound matching and sound blending; and learning-rate tests for picture-sound association and word segmentation. For background information, a letter-naming test was also included. Data were gathered on two forms of each visual test by testing a child on the complete test battery one day and the alternate forms of the visual tests the preceding or following day. Item analyses, test reliabilities, test correlations, and descriptive statistics are reported for the test battery. Implications for further test revision are discussed.

Kamm, M. R., & Pittelman, S. D. The 1972-73 field test of the Prereading Skills Program. Technical Report No. 310. 5.2.41.60.02.01.01. 128 pp. May 1975. ED 113 700

This report documents the 1972-73 field test of teacher training techniques for the Prereading Skills Program. It also describes supplementary evaluation of specific program components and subsequent revisions.

The Prereading Skills Program is a kindergarten-level instructional program designed to prepare children for beginning reading instruction. The program teaches three visual skills and two sound skills which are logically related to the reading process and which are judged to be prerequisites for success in learning to read.

Information on the effectiveness of teacher training workshops was gathered by means of questionnaires, observations, and interviews. Analysis of the data indicated that teachers did not need extensive training to implement the Prereading Skills Program, provided that supplementary information on the use of specific program components was included in the teacher materials.

Information on program components was gathered by means of questionnaires and feedback sessions with teachers who had used the Prereading Skills Program in 1972-73. Their comments suggested changes which would further improve the program, but identified no significant problems. Further refinements of the program are planned for 1974-75, when it is scheduled for commercial publication.

Kamm, M., Zajano, N., Hubbard, W. D, & Pittelman, S. The 1971-72 field test of the Prereading Skills Program. Technical Report No. 269. 5.2.41.60.01.01.01. 52 pp. July 1973.

Evaluation of the usability of the Prereading Skills Program was carried out by means of observation of teachers using the program and consultation with them and by means of questionnaires answered by teachers and principals. Information gathered by these procedures confirmed that kindergarden teachers could successfully implement an individualized program to teach prereading skills.

A strong indication of the success of the program was the attitudes of teachers who participated in the field test. Many of them expressed concern before beginning the program that the program appeared too highly structured and too intellectually demanding for kindergarten children. They were also concerned that the classroom management would be impractical to implement. At the conclusion of the field test, however, teachers strongly endorsed the program, stressing its organized sequence of activities and its provisions for individualization of instruction.

Venezky, R. L. Language and cognition in reading. Technical Report No. 188. 32 pp. January 1972. ED 067 646.

The preliterate child must acquire from reading instruction at least the following skills: (a) appropriate scanning behavior, (b) letter and word recognition, (c) letter-sound generalizations, and (d) comprehension of written materials, at least to the degree that the reader can comprehend the same message when received aurally.

Almost all modern methods for teaching reading include letter-sound learning somewhere in the teaching sequence, although the amount and exact placement of this training account for the central disagreement among methods. Classroom comparisons of different teaching methods have contributed little to a general understanding of reading pedagogy, while more closely controlled laboratory experiments have not been able to simulate the complex interactions of variables which characterize the classroom. A more valid experimental procedure might be to work with existing (or new) programs, altering small, discrete segments of the materials and methods, and measuring marginal gain. In this way critical components of an instructional program could be isolated and examined in situ. This is, in essence, what Piaget has advocated under the title "experimental pedagogy."

Venezky, R. L. Prereading Skills: Theoretical foundations and practical applications. Theoretical Paper No. 54. 5.2.41.10.02.01.01. 28 pp. May 1975.

The reading readiness approach receiving the most emphasis today is the prereading skills approach. From an analysis of initial reading tasks prerequisite skills are identified. Then those skills which are found lacking in a high percentage of children are selected for inclusion in a prereading program. By this procedure at least three specific visual skills and at least two sound skills have been identified by a number of studies.

Children who enter kindergarten without all of the visual and sound prereading skills generally will not acquire them on their own. Direct, individualized instruction in the specific skills seems to be required to ensure mastery.

Based on the prereading skills isolated by a four-year research program, and instructional constraints resulting from the IGE model, a prereading skills program (PRS) was developed during the period 1970-1974. After an initial tryout of materials and activities, a full-year program was developed and pilot tested. A major revision of the program was done prior to the 1972-73 school year and plans were later made for further revisions and for commercial production.

Venezky, R. L., Green, M., & Leslie, R. Evaluation studies of the Pre-reading Skills Program. Technical Report No. 311. 5.2.41.60.02.01.02. 45 pp. August 1975. ED 116 153

The Pre-reading Skills Program (PRS) was developed at the Wisconsin Research and Development Center for Cognitive Learning. Research on prereading skills was conducted from 1966 to 1969. The developmental period, 1970 to 1974, included piloting and field testing instructional materials, teachers' manuals, assessment instruments, and management system.

During 1972-73, a study was designed and carried out to investigate achievement associated with PRS. Taking part in the study were kindergarten children from (1) classes whose teachers were using PRS for the first time, (2) classes whose teachers had used PRS during the previous year, and (3) classes whose teachers were not using PRS; and first grade children who had not used PRS in kindergarten.

The major result of the study was that kindergarten children who used PRS scored significantly higher (alpha equals .01) on five prereading skills tests than children who did not use the program. The study also showed that there is a high percentage of retention of mastery or nonmastery status between the end of kindergarten and the beginning of first grade.

WISCONSIN DESIGN FOR READING SKILL DEVELOPMENT
5.2.45

Associated Faculty:
Wayne R. Otto, Department of Curriculum and Instruction

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Chester, R., Hubbard, W. D., & Van Blaricom, G. *Field test report on self-directed, interpretive, and creative reading elements of the Wisconsin Design for Reading Skill Development*. Technical Report No. 330. 5.2.45.60.04.01.01. 55 pp. May 1975. ED 113 696.

This study of the self-directed, interpretive, and creative reading elements of the *Wisconsin Design for Reading Skill Development* was conducted to gather descriptive data about implementation strategies being developed and practiced by field test teachers, and to gather evaluative information about the usability of various management and instructional materials provided in the program. Questionnaires and telephone interviews were employed to collect information from one Colorado and two Wisconsin elementary schools involved in the field test. The report contains descriptions of the materials and techniques used to collect the data, the results obtained, and a discussion of revisions and modifications resulting from the study.

Coomber, J. E. *A psycholinguistic analysis of oral reading errors made by good, average, and poor readers*. Technical Report No. 232. 115 pp. September 1972. ED 071 068.

The oral reading errors of selected third grade children were analyzed as a means of studying differences in reading strategy between good, average, and poor readers. The graphic-phonetic and syntactic appropriateness of errors to their printed stimulus words was considered. Reading materials were controlled for vocabulary and syntactic difficulty in order to hold the error quantity factor constant and also to consider syntactic competency without the effect of vocabulary difficulty. Thus readers of all levels of reading proficiency could be compared at similar levels of error rate as well as on the same passages.

The data revealed that the differences between readers of different levels of reading proficiency were on the graphic-phonetic level. The better the reader, the greater was the graphic-phonetic appropriateness of his/her oral reading errors to the printed stimuli in long word errors. This observation did not hold true with errors on short words, largely because of the word frequency factor. On the syntactic level, a study of the grammatical appropriateness of errors and the results of several psycholinguistic tests of the data indicated no significant differences between the groups in their syntactic competence in reading.

Ellison, M. L. *Compendium of reading materials and teaching techniques for the Wisconsin Prototypic System of Reading Instruction*. Practical Paper No. 7. Out of print. 51 pp. February 1969.

The materials and techniques listed in the compendium were selected on the basis of practicality rather than a particular philosophy of reading instruction. At this stage of development the compendium should be considered a prototype. It needs to be tested for its usability and practicality for teachers in an elementary school setting.

Klopp, P. *The Wisconsin Design for Reading Skill Development: Comprehension--A report on the 1973-74 small-scale field test*. Technical Report No. 373. 5.2.45.60.06.01.01. 110 pp. June 1976.

This report describes the evaluation plan for the 1973-74 small-scale field test of the Comprehension element of the *Wisconsin Design for Reading Skill Development* and presents results for the eight field test objectives investigated.

Field test objectives 1 to 3 pertained to product usability; results, on the whole, were positive. Objectives 4 to 8 were concerned with product effectivensss. Results for these objectives are reported according to site type, small-city or suburban or urban.

Otto, W. *Overview of the Wisconsin Prototypic System of Reading Instruction in the elementary school*. Practical Paper No. 5. Out of print. 68 pp. August 1968. ED 024 541.

This prototypic reading guide provides a framework for individually guided instruction in reading and is useful for individual diagnosis and for simplifying and guiding group procedures. (It is a revision of Working Paper No. 7.)

Otto, W., Houston, C., & Askov, E. (Eds.), *Reading and the culturally disadvantaged: Selected papers from the annual Institute in Reading, 1966*. Theoretical Paper No. 10. Out of print. 19 pp. December 1967.

This paper includes talks by A. J. Harris and R. A. McMenemy and a discussion by Doris M. Cook and Ruth W. Baldwin. Certain ideas recurred, among them the recognition that the child from a deprived environment comes to school with several strikes against him/her and that attempts to help must come in preschool programs.

Sals, D., & Hubbard, D. *The Wisconsin Design for Reading Skill Development: Study Skills--A report on the type I field test, 1971-73*. Technical Report No. 341. 5.2.45.60.03.01.01. 238 pp. May 1975.

A field test of the precommercial version of the Study Skills element of the *Wisconsin Design for Reading Skill Development* was conducted in

22 schools from 1971 to 1973. The test was designed to determine the effectiveness of the program in terms of student achievement, to document the degree to which recommended implementation procedures were followed, to determine the feasibility of the program for the elementary school, and to gather information for revisions.

Study Skills students showed consistent improvement on program-embedded and standardized measures. Schools with prior reading achievement below national norms showed greater improvement than schools above national norms. Overall implementation was adequate but less than expected. Little relationship between adequacy of implementation and achievement was observed. Schools with team organization had the most positive outlook toward the program. Formative findings indicated a need to reorganize and streamline the program.

COMPUTER SYSTEMS FOR IGE
5.2.73

Associated Faculty:
Dennis W. Spuck, Department of Educational Administration

Project Coordinator:
Sidney L. Belt

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Lawrence, B. F. *Numerical procedures in the optimal grouping of students for instructional purposes*. Technical Report No. 399. (Ph.D. dissertation) 5.2.73.30.30.02.21. September 1976.

This study was concerned with the problem of whether a computerized procedure can be developed which assigns students to instructional groups, which maximizes the homogeneity of these groups based on relevant student learning characteristics, and which takes account of realistic administrative constraints such as eligibility for group membership, sizes of groups, and numbers of groups.

The procedure developed to solve this problem was mathematical in nature and involved utilizing computer technology in its implementation. It aimed to facilitate, in part, the management of a particular individualized program of instruction, namely Individually Guided Education (IGE).

Based on an initial survey of clustering techniques including hierarchical techniques, optimization-partitioning techniques, density-seeking techniques and clumping techniques, a decision was made that the optimization-partitioning techniques applied most directly to the problem being studied. This set of techniqus applied most directly to the problem being studied. This set of techniques was further surveyed in terms of complete enumeration, implicit enumeration procedures and heuristic procedures which yield local optimal solutions. Despite their disadvantage of yielding sub-optimal solutions, the heuristic partitioning procedures were considered to most closely meet the requirements of the problem.

Four algorithms were designed and evaluated on the basis of their performances on a set of tests which involved varying the parameters of the grouping situation, such as the data on learner characteristics, data on group eligibilities, the number of groups formed, the sizes of the groups, and the single or multiple assignment of instructional topics to groups.

Two equally important criteria were used in the choice of the most effective of the four algorithms--the homogeneity of groups measured on selected learner variables and the number of students omitted from the groups. The algorithm which proved to be most effective was the one which initially assigned instructional topics to groups, matched group sizes with skills, allocated eligible students to these groups to maximize their homogeneity and then applied other administrative constraints.

Spuck, D. W., Hunter, S. N., Owen, S. P., & Belt, S. L. Computer management of individualized instruction. Theoretical Paper No. 55. 5.2.73.20.01.01.01. 37 pp. May 1975.

The generalized Wisconsin System for Instructional Management (WIS-SIM) is being developed to serve the management needs of IGE. This paper identifies key dimensions which help define individualized education and relates these to essential components of a system of computer managed instruction (CMI). CMI processes are integrated into a generalized model which accounts for the major structural and process delineations of programs of individualized education of which IGE is an example.

CMI as a management information system provides instructional managers with information required for decision making in individualized educational programs. The major processes specified in the model are testing (placement and posttest), test scoring, achievement profiling, diagnosing, and prescribing. CMI systems have the greatest potential in the management of instructional resources in the prescriptive process and the diagnosis of student instructional needs.

WIS-SIM, unlike other CMI systems, incorporates a "total system" approach. It can assist in the effective implementation of an individualized program of learning for each student and also monitor the school's instructional program.

MATERIALS AND STRATEGIES FOR IGE STAFF DEVELOPMENT AND IMPLEMENTATION
5.2.81

Associated Faculty:
Marvin Fruth, Department of Educational Administration

Project Coordinator:
Nancy Evers

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Evers, N. A. IGE/MUS-E first year implementation cost survey. Technical Report No. 256. 5.2.81.80.10.01.05. 67 pp. May 1973. ED 085 844.

The basic question of the study was: Are there any increases or decreases in expenditures in the categories of student costs, staff costs, staff development, instructional materials and equipment, and plant and furnishings among a stratified sample of schools during their first year of implementing IGE/MUS-E? The "Survey of Costs to Implement IGE/MUS-E" instrument was developed and employed to collect data. Descriptive statistical analyses were utilized. The range of scores and median score for the various program elements are reported.

A majority of the schools reported: (1) An increase in the number of paid paraprofessionals and an increase in expenditures for inservice materials and for workshops and conferences. (2) No increase or decrease in expenditures for (a) vandalism and pupil absenteeism; (b) salaries of school personnel, disregarding normal increments; (c) consultant services; (d) instructional materials and equipment; (e) school plant and furnishings. (3) No increase or decrease in the number of certified teachers, central office personnel or other staff.

Klenke, W. H., & Evers, N. A. Individually Guided Education: A simulation. Practical Paper No. 30. 97 pp. February 1972.

The simulation is designed to provide the participant an IGE learning experience developed according to the steps of the Instructional Programing Model. Participation in this as part of a Principal-Unit Leader Staff Development Workshop will enable the participants to conduct this simulation as part of the staff development workshop which they design and implement for teachers and other staff members in their schools. It is recommended that this simulation be used only as part of a total staff development training program and not as an isolated activity.

One-week advanced leadership institutes for experienced unit leaders, building principals, and reading staff teachers in multiunit schools-elementary. Technical Report No. 271. 5.2.81.80.10.01.02. 92 pp. July 1973. ED 095 101.

This report presents the evaluation of a series of one-week advanced leadership institutes for experienced IGE/MUS-E personnel. These institutes were conducted by seven teacher education institutions that cooperated with the Wisconsin Research and Development Center for Cognitive Learning to carry out the activities. Funds for these institutes were provided by a grant from the Bureau for Education Professions Development of the United States Office of Education.

These institutes were carried out in the context of the four-phase model of implementation utilized by the Center in cooperation with state education agencies, teacher education institutions and local school districts. The four phases are awareness, first-year installation, maintenance refinement, and institutionalization. The one-week institutes comprised one set of activities carried out in the maintenance-refinement phase during the 1971-1972 and 1972-1973 school years.

The evaluation shows that such institutes can feasibly be conducted by teacher education institutions and that they are a viable means for providing experiences to help school staffs refine IGE practices.

Residential academic-year programs for prospective unit leaders, building principals, and reading staff teachers in multiunit schools-elementary. Technical Report No. 267. 5.2.81.80.10.01.04. 31 pp. July 1973. ED 098 238.

If a new educational program, practice, product, or process is ever to become established in the schools, it is important for teacher education institutions to have programs to prepare personnel to successfully utilize the products of educational research and development. When teacher education institutions can assume this role, then substantial funds now expended for implementation efforts can be devoted to newer ideas.

The Multiunit School-Elementary (MUS-E) is the organizational administrative component of the system of Individually Guided Education (IGE) currently under development at the Wisconsin Research and Development Center. As the number of MUS-E schools increases there is an increasing need for personnel professionally prepared to assume their roles in these schools; a need that cannot be met through workshops and other inservice activities alone.

This technical report summarizes the programs and activities of three teacher education institutions which, with federal funds, developed and carried out graduate level programs for unit leaders, MUS-E building principals, and reading staff teachers. These programs were developed to fit the requirements of particular institutional settings and are, therefore, not necessarily applicable in all situations. They do, however, demonstrate the kinds of programs teacher education institutions can implement as they begin to assume their role in supplying professional staff for IGE/MUS-E schools.

Walter, J. E. (Ed.) Continuation of the dissemination/implementation of Individually Guided Education, 1974-75. Technical Report No. 402. 5.2.81.80.08.01.01. 220 pp. November 1976.

This report presents information relative to the continuing dissemination and implementation of Individually Guided Education (IGE) during the period July 1, 1974 through December 31, 1975.

Attention is given in Chapter I to the need for establishing extraorganizational facilitative environments for IGE schools. In Chapter II, the discussion focuses on a description of the model for state IGE networks and a discussion of how this model is being applied in 23 states. Chapter III is devoted to strategies and conditions for implementing IGE in urban and inner-city schools. Chapter IV describes the national element of the facilitative environment for IGE with the emphasis on the four IGE institutes. In Chapter V, leadership development activities during the duration of this project are described and the evaluation of the workshops reported. Finally, in Chapter VI, the discussion focuses on an assessment of the major elements in the IGE facilitative environment.

Walter, J. E., Gardner, B. T., & MacDermot, H. G. A status report on the implementation of IGE: 1971-1974. Technical Report No. 345. 5.2.81.80.11.01.05. 162 pp. July 1975. ED 114 373.

This report is intended to serve two purposes: to complete all the reporting requirements relative to implementation funding provided by USOE and NIE, and to summarize the strategies, efforts, and results of implementing IGE nationally since 1971.

Chapter II of this report briefly describes the rationale for the development of IGE, the major components of IGE, and important events in its development and early implementation efforts. Chapter III focuses on the model and basic strategies which guide the implementation of IGE. Chapter IV describes the history of the relationship of the Wisconsin Research and Development Center for Cognitive Learning to states and the development of state IGE networks. Chapter V presents a history of leadership development activities and an evaluation of the leadership workshops.

SPECIALIZED OFFICE 3
6.4.10.

Associated Faculty:
Richard Rossmiller, Center Director

Project Manager:
Jean Elder

Coordinator:
Mary Hill

TECHNICAL REPORTS, THEORETICAL PAPERS,
PRACTICAL PAPERS, AND BOOKS

Latham, G. Teacher use of instructional materials and other matters related to special education IMC/LRC collections. Theoretical Paper No. 59. 6.4.10.23.02.01.02. 44 pp. February 1976. ED 126 663.

A large scale, national instructional materials support program for handicapped children was initiated in 1964 by the Bureau of Education for the Handicapped and maintained for a period of ten years. This program which was comprised of regional, state, and local instructional materials centers provided a beginning base of knowledge on the needs for, uses of, and priorities for instructional materials for use in teaching handicapped children. This paper reviews the knowledge base and provides insight and direction to future work in the area of materials evaluation and selection for handicapped children.

SERVICE SECTIONS

TECHNICAL SERVICES
5.9.10

Director:
Conrad G. Katzenmeyer

Assistant Scientist:
W. Donald Hubbard

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Conry, J. J. Validity of the rearrangement exercise as a predictor of essay writing ability. Technical Report No. 23. (Master's thesis) 19 pp. May 1967. ED 016 464.

Variations in scoring the rearrangement exercise, in which the student is required to order a series of events, are investigated empirically. Data from the Paragraph Organization portion of the CEEB English Composition Test were rescored to determine which method yielded scores that correlated best with the total essay score.

Goodwin, W. L. The effects on achievement test results of varying conditions of experimental atmosphere, notice of test, test administration, and test scoring. Technical Report No. 2. Out of print. 44 pp. November 1965. ED 010 202.

Because of the frequent use of tests as the instruments for data collection in classroom experimentation, 64 sixth grade classrooms representing four achievement strata were tested on a standardized arithmetic test to clarify the complex interaction of variables in the classroom. Of special concern was the effect that "participating in an experiment" has on the teacher as subexperimenter in classroom experimentation.

Harris, M. L., & Harris, C. W. A factor analytic interpretation strategy. Technical Report No. 115. 37 pp. March 1970. ED 044 309.

This paper illustrates the use of a strategy for determining the comparable common factors in a set of data. Both orthogonal and oblique derived solutions were obtained for each of several different initial factor methods. The results were compared across the various solutions and three types of factors were determined: comparable common factors, comparable specific factors, and noncomparable factors.

Houston, T. R., Jr. On the construction of Latin squares counterbalanced for immediate sequential effects. Technical Report No. 25. (Master's thesis) 19 pp. May 1967. ED 013 981.

This paper deals with Latin squares as a control for progressive and adjacency effects in experimental designs. The history of Latin squares is reviewed, and several algorithms for the construction of Latin and Greco-Latin squares are proposed. Results are of particular application to rating studies and to designs requiring the "rotation" of teachers in classroom research.

Klausmeier, H. J., Wardrop, J. L., Quilling, M. R., Romberg, T. A., & Schutz, R. E. With remarks by Leslie D. McLean. Research and development strategies in theory refinement and educational improvement. Theoretical Paper No. 15. Out of print. 24 pp. November 1968. ED 064 662.

Research and development strategies designed for improving classroom instruction and for refining teacher-learning theory implemented at the Wisconsin Research and Development Center for Cognitive Learning and the Southwest Regional Laboratory are discussed in papers by the directors of each and by members of the R & D Center staff.

Porter, A. C. A chi-square approach to discrimination among occupations, using an interest inventory. Technical Report No. 24. (Master's thesis) 41 pp. May1967. ED 040 298.

In this report, a set of weights, established by the chi-square technique, is empirically compared with the Kuder weighting scheme. Data were scored by both sets of weights, and the percentage of males correctly classified according to occupation for each weighting scheme was determined.

Quilling, M. R., Pizzillo, C. M., Hubbard, W. D., & Fischbach, T. J. Saturday Subway Ride: A report on the initial tryout. Technical Report No. 210. 70 pp. December 1971. ED 065 886.

Saturday Subway Ride, a program designed to teach pupils creative thinking techniques and positive attitudes toward creative ideas, is a 92-page workbook in a story-exercise format. Secondary objectives for the product include improving verbal fluency and creative writing. Three classrooms, 61 sixth graders and 34 fifth graders at two Wisconsin schools, used the program for two months. The purpose of this paper is to report the results of this initial field study.

The major findings included information on the usability of the product and student attainment of product objectives. Teacher annotations, on-site visitations, and rated pupil workbooks indicated that considerable reworking of the exercises was needed, although the teachers gave satisfactory ratings to the program overall. Ratings of the exercises showed that only some pupils learned adequately the five techniques of creative thinking: Part-Changing, Checkerboard Check-list, Find-Something-Similar, and Brainstorming Methods. Changes from pretest to posttest on the 22-item attitude survey and the verbal fluency tests were both significant and positive. Finally, ratings of short writing samples showed improvement for girls but not for boys from pretest to posttest.

Remstad, R. C. Optimizing the response to a concept attainment task through sequential classroom experimentation. Technical Report No. 85. (Ph.D. dissertation) 137 pp. April 1969. ED 035 956.

This study tested the possibility of using the optimization techniques of the response surface model in maximizing the response to a concept learning task.

Toothaker, L. E. An empirical investigation of the permutation t-test as compared to Student´s t-test and the Mann-Whitney U-test. Technical Report No. 174. 50 pp. February 1972.

This study is an investigation of comparison of the permutation t-test with Student´s t-test and the Mann-Whitney U-test. The comparison was made for small samples for three distributions including a normal distribution, a uniform distribution, and a skewed distribution. The properties of each test compared were the probability of a Type I error and the power against a location-shift alternative hypothesis.

Research indicates that the permutation t-test is an acceptable statistical procedure for the two-sample problem for the normal and uniform populations and suggests that it might be more desirable than the traditional Student´s t-test when sample sizes are proportional to the means and the parent population is nonnormal and asymmetric. Further research is needed before a more definite statement can be made about the permutation t-test sampling from nonnormal populations.

INFORMATION SERVICES
5.9.40.

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Buchanan, A. E., Fischbach, T. J., & Marshall, J. L. *Evaluation of Patterns in Arithmetic in grades 1-4, 1970-71: Effects on students*. Technical Report No. 302. 5.9.40.10.01.02.01. 108 pp. November 1974.

A large-scale summative, comparative evaluation of *Patterns in Arithmetic* (PIA), a modern televised arithmetic curriculum for Grades 1-6, was carried out in Grades 1-4 in 92 rural and urban schools in five sites during the 1970-71 school year. About 5,000 pupils in the experimental schools received PIA as their basic mathematics course while another 5,000 students in control schools continued to use conventional arithmetic programs. Achievement was measured by standarized tests of mathematics concepts, computation, and applications in problem solving. Results indicated that achievement of control school pupils was about equal to that of students in the experimental group. The results did not vary by sex, grade level, or site.

WITHIN- AND AMONG-SENTENCE VARIABLES
Project 101--Phase 2

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Davidson, R. E., & Dollinger, D. E. *The effects of deep structure variations in sentences: Free recall and paired-associate learning.* Technical Report No. 110. 14 pp. December 1969. ED 039 617.

Three experiments examined the "psychological reality" of deep structure variations for sentences of a language. Analysis of a variety of dependent variables from a variety of experimental paradigms with two different populations suggested that deep structure variations produce differential effects in learning and recall. Two experiments with university students and a third with second grade children as *S*s were performed.

Davidson, R. E., & Levin, J. R. *Imagery in transfer.* Technical Report No. 249. 11 pp. April 1973. ED 082 141.

Second and fourth grade children learned two 25-item paired-associate mixed lists under three experimental conditions: instructed imagery, imposed imagery, and control. Four specific transfer paradigms and a reference paradigm were represented in the lists. The specific transfer paradigms were constructed such that a first list (A-B) stimulus term (a pictured, multiple-meaning word) was represented in a second list as an identity (A-C) or changed with respect to its image (A/I-C), function (A/F-C), or meaning (A/S-C). Analysis of the specific effects revealed monotone-decreasing negative transfer across the change paradigms. The effect was more pronounced for second grade *S*s.

ACTIVE MANIPULATION AND PERCEPTUAL-COGNITIVE PROCESSES
Project 101--Phase 5

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Wolff, P. *Same- and mixed-modality presentation in continuous recognition memory*. Technical Report No. 156. 9 pp. March 1971. ED 050 423.

Words were presented either visually (V) or through auditory methods (A) in a continuous recognition memory task. Each word occurred twice, with equal numbers of item pairs in each of the four possible modality combinations (A-A, V-V, A-V, and V-A). The first and second occurrences of a word were separated by 12, 24, 48, or 96 intervening items. Two lists, common and rare nouns, were used. Averaging data from the two lists, a greater number of misses occurred on mixed-modality than same-modality pairs at the first three intervals. At the 96-item interval mixed-modality was superior to same-modality presentation for the rare list only. The results are discussed in terms of Underwood's (1969) multi-attribute theory of memory.

Wolff, P. *Mirror-image confusability in adults*. Technical Report No. 203. 9 pp. January 1972. ED 064 647.

Several studies have indicated that children have difficulty differentiating mirror-image stimuli. In the present study adults were required to classify pairs of horseshoe stimuli as same or different. Response times were compared for stimulus pairs that varied in orientation (left-right vs. up-down) and spatial plane of the pair (horizontal vs. vertical). Stimulus pairs in which the orientation matched the spatial plane of the pair (i.e., horizontal and left-right or vertical and up-down) took longer to classify than stimulus pairs in which these two variables were crossed. These results are interpreted as reflecting the necessity of synthesizing two sources of information in order to compare the former pair types--temporally encoded visual information and directional information from the motor scanning process. Implications for the source of children's difficulty with mirror-image stimuli of this type are discussed.

COMPUTER SIMULATION AND THEORY

Project 102--Phase 1

Principal Investigator:
Frank B. Baker, Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Baker, F. B. *The development of a computer model of the concept attainment process: A preliminary report*. Occasional Paper No. 5. Out of print. 61 pp. October 1966. ED 013 978.

This paper describes the development of an IPL-V computer model to obtain a better understanding of the psychological processes underlying human concept attainment. The model has been based upon theoretical grounds, "think aloud" protocols, and speculations as to the nature of concept attainment.

Baker, F. B. *The development of a computer model of the concept attainment process: A final report*. Theoretical Paper No. 16. 112 pp. November 1968. ED 064 660.

Through the development of a computer model of the concept attainment process the Computer Simulation Project has obtained a better understanding of the psychological processes underlying human concept attainment. The model suggests that the majority of the information processed by human subjects is internally created; hence new techniques are needed to elicit this information.

TASK AND TRAINING VARIABLES IN HUMAN PROBLEM SOLVING AND CREATIVE THINKING
Project 103

Principal Investigator:
Gary A. Davis, Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Davis, G. A. The current status of research and theory in human problem solving. Occasional Paper No. 2. Out of print. 23 pp. June 1966. ED 010 506.

Problem-solving theories in three areas are summarized: traditional learning, cognitive-Gestalt approaches, and more recent computer and mathematical models of problem solving. Recent empirical studies are categorized according to the type of behavior elicited by the task: overt or covert trial-and-error behavior. The review extends from January 1960 to June 1965.

Davis, G. A., Houtman, S. E., Warren, T. F., & Roweton, W. E. A program for training creative thinking: I. Preliminary field test. Technical Report No. 104. Out of print. 19 pp. November 1969. ED 036 019.

A three-part model conceptualizing the components of "creativity" as (1) appropriate creative attitudes, (2) various cognitive abilities, and (3) idea-generating techniques, suggests a structured approach for improving creative thinking.

Davis, G. A., Houtman, S. E., Warren, T. F., Roweton, W. E., Mari, S., & Belcher, T. L. A program for training creative thinking: Inner city evaluation. Technical Report No. 224. 30 pp. April 1972. ED 070 809.

The effectiveness of a workbook for training creative thinking, Thinking Creatively: A Guide to Training Imagination, was evaluated with a sample of 198 inner-city students. The materials seek to teach attitudes which predispose an individual to behave more creatively and techniques for producing new combinations of ideas.

Despite the finding that both the training materials and the testing instruments were difficult for many of the Ss to read and thoroughly comprehend, most students and teachers felt that students had benefitted from the creativity training experience. Two experimental classes showed modest gains in Torrance Test scores; Ss in all four experimental classes displayed more creative attitudes as indexed by a number of items in the 20-item attitude survey.

Davis, G. A., Manske, M. E., & Train, A. J. *Training creative thinking*. Occasional Paper No. 6. Out of print. 18 pp. January 1967.

Method and orientations for stimulating creative thinking in the fields of industry, education, and psychology are reviewed. The review extends from January 1958 to July 1966.

Davis, G. A., Roweton, W. E., Train, A. J., Warren, T. F., & Houtman, S. E. *Laboratory studies of creative thinking techniques: The checklist and morphological synthesis methods*. Technical Report No. 94. 24 pp. September 1969. ED 036 957.

The main purpose of six experiments was to demonstrate that the use of idea checklists, a standard and intuitively appealing creative-thinking technique, will increase idea quality and quantity. College students were allowed 10 minutes, 20 minutes, or (in one experiment) unlimited time to find ideas for "product improvement" problems.

Davis, G. A., Train, A. J., & Manske, M. E. *Trial and error vs. "insightful" problem solving: Effects of distraction, additional response alternatives, and longer response chains*. Technical Report No. 26. 10 pp. May 1967. ED 013 982.

This report is an extension of Davis´ earlier investigations of important pretraining variables which critically influence performance in human problem solving. The task used is a switch-light problem in which the subject attempts to achieve a particular pattern of lights in a matrix by manipulating switches on a response panel.

Freiheit, S. G. *The effects of a training program upon the creative performance of fourth grade children*. Technical Report No. 79. (Master´s thesis) 114 pp. February 1969. ED 036 045.

Two groups of fourth grade pupils, one experimental and one control, totaling 45 subjects, provided the population of the study. Both groups were pretested and posttested with the Torrance Tests of Creative Thinking.

Roweton, W. E. *Creativity: A review of theory and research*. Theoretical Paper No. 24. 28 pp. May 1970. ED 044 012.

Creative behavior is a rapidly expanding interest area. In the present review, various theoretical interpretations or "explanations" of creative thinking are classified into five major categories: (1) definitional approaches, (2) dispositional or personality-based theories, (3) psychoanalytic viewpoints, (4) behavioristic theories, and (5) operational approaches.

Warren, T. F. *Creative thinking techniques: Four methods of stimulating original ideas in sixth grade students*. Technical Report No. 169. (Ph.D. dissertation) 195 pp. September 1971. ED 057 406.

This dissertation reviews the literature on creative behavior and reports the results of a study in which the operational approach to creativity was explored. Each of 119 sixth grade students was assigned randomly to one of six treatment levels. The *S*s in four levels read booklets which described principles of creative thinking techniques, along with presenting examples and exercises. One group read a control booklet, while another read no booklet. Following this, all *S*s completed three creativity tests and an attitude inventory. Hypotheses predicted differences among treatment levels as a function of the playfulness or organizational emphasis of the various techniques. The more playful techniques, e.g., Personal Analogy, were expected to produce higher scores on measures of Flexibility, Originality, and Best Ideas. The more organized techniques, e.g., Part Changing, were expected to produce higher scores on Fluency. Results did not support these hypotheses.

RULE LEARNING
Project 105

Principal Investigator:
H. J. Fletcher, Associate Professor of Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Fletcher, H. J. Toward a general model for describing cognitive processes. Theoretical Paper No. 23. Out of print. 17 pp. December 1969. ED 043 087.

The first part of this paper briefly describes two studies on cognitive processes in children. One study examined the ability of kindergarten and first grade children to apply a simple rule of logical inference in order to solve a two-object discrimination problem.

The usefulness of this theoretical model for educational research was demonstrated by describing a successful elementary school mathematics project which stressed the analysis of mathematical statements into statements of underlying cognitive operations or processes.

Fletcher, H. J., & Garske, J. P. Logical inference in discrimination learning of young children. Technical Report No. 50. Out of print. 9 pp. April 1968. ED 036 314.

This study reports on children's learning of cognitive rules. The processes of classification and logical inference in 76 four to seven year old children were investigated with the finding that some of these children did demonstrate inferential reasoning. Used successfully, the task in this study provides a basis for further research on the development of logical reasoning in young children.

Grogg, T. M. A developmental study of sign-differentiated and non-sign-differentiated conditional discrimination learning. Technical Report No. 55. Out of print. 17 pp. May 1968. ED 024 103.

The ability to make relational discriminations, i.e., to solve problems by responding to the relationships between cues rather than to the absolute properties of individual cues is examined. The laboratory analogy of this type of problem is referred to as a conditional discrimination problem. The difference between a sign-differentiated (SD) and a non-sign-differentiated (NSD) conditional discrimination problem is empirically demonstrated, the former not necessarily requiring a relational rule for solution but the latter necessarily involving true relational learning. Next, by testing sixth graders, tenth graders, and college sophomores, 7

data are provided concerning the developing ability to solve such problems. The results indicated that at each grade level the NSD problem was more difficult than the SD problem. Also revealed was a monotonic developmental trend in conditional problem-solving ability. The results were interpreted in terms of (1) a hierarchy of response tendencies and (2) a differential cognitive requirement.

Kemmerer, J. T., Sawin, D. B., & Freiheit, G. Inference in discrimination learning of early elementary school children. Technical Report No. 74. 11 pp. February 1969. ED 069 343.

Sixteen kindergarten and 28 first grade children were tested on two-choice object discrimination problems. A prompt light indicated the positive (reward) object P on all training trials, and these were followed by a single nonprompted test trial during which a new object (X) replaced either P (X+N problems) or N (P+X problems) or neither (P+N control problems). Two additional control problems assessed verbal responses to the P and N objects alone. All Ss followed the prompt (i.e., displaced only P) and therefore never directly observed the nonreward value of N on prompted trials. However, performance was significantly above chance on nonprompted X+N trials. Control conditions and verbal reports permitted the conclusion that the negative (nonrewarded) value of N had been inferred while responding to P on prompted trials.

Replicating previous findings that preschool and first grade children were able to achieve a significant degree of inferential learning about a non-responded-to object on a two-choice object discrimination task, the present results further suggest that stimulus novelty is not an important factor in cue-substitution procedures.

MOTIVATED LEARNING
Project 106

Principal Investigator:
Arthur Staats, Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Minke, K. A., Jr. *The grammatical form class of verbs and the operant conditioning of word classes*. Technical Report No. 84. (Ph.D. dissertation) 105 pp. June 1969. ED 037 446.

An analysis of part-of-speech membership was made utilizing certain mechanisms that have been proposed to explain the nature of word classes. One implication of the model was that sentences may be regarded as sequences of grammatical habit families.

Minke, K. A., Jr. *The early development of verbal mediation in children: An inter-paradigm comparison*. Theoretical Paper No. 21. 14 pp. July 1969. ED 036 864.

It is suggested that because of the tendency of psychologists to characterize behavioral phenomena in distinctive ways, it is frequently difficult to determine if the same labels are being used to refer to the same phenomena by different investigators. One strategy to overcome this problem is to determine if similar conclusions are reached when the same dependent variable is manipulated by various investigators operating under different paradigms.

Staats, A. W. *Emotions and images in language: A learning analysis of their acquisition and function*. Occasional Paper No. 1. Out of print. 18 pp. June 1966. ED 010 213.

It is suggested that a learning theory that integrates instrumental and classical conditioning, cutting across theoretical lines, can serve as the basis for a comprehensive theory of language acquisition and function. In this paper, Staats illustrates the possibilities of such an integrated learning approach.

Staats, A. W. *Replication of the "Motivated Learning" cognitive training procedures with culturally deprived preschoolers*. Technical Report No. 59. Out of print. 17 pp. August 1968. ED 029 708.

This research is concerned with training children to count and write. A reinforcer system, used to maintain the children's attention and participation over a long period of time, is based upon tokens which are backed up by material reinforcers. Subjects were 12 four year old culturally deprived children.

Staats, A. W., Minke, K. A., Jr., & Butts, P. A token-reinforcement remedial reading program administered by instructional technicians. Technical Report No. 127. 23 pp. May 1970. ED 042 301.

Reading materials in a stimulus-response presentation procedure combined with a token-reinforcement motivational system were employed with 32 ghetto children in a remedial program. The program was administered by subprofessional instructional technicians supervised by a teacher trained in the experimental methods. The children, who were problem learners, attended well, worked hard, and learned well in the 4- to 5-month program.

The results showed the procedures and reinforcement system to be effective in producing improved attention and work behaviors in the children.

Staats, A. W., Minke, K. A., Jr., Goodwin, W. L., & Landeen, J. "Motivated Learning" reading treatment with additional subjects and instructional technicians. Technical Report No. 22. 15 pp. March 1967. ED 015 110.

This report describes the successful extension of learning principles to complex human behavior, namely, reading behaviors of highly retarded, emotionally disturbed, and culturally deprived readers. The instructional program and procedures developed by Staats were administered to junior high school students by persons untrained in teaching.

Van Mondfrans, A. P. Learning principles and procedures applied to remedial reading with normal and educable mentally retarded fourth, fifth, and sixth grade children. Technical Report No. 62. 26 pp. September 1968.

This study was designed to further validate the Staats procedures and to demonstrate their generality by extending their application to a population of pre- and early-adolescent retarded readers.

MEDIA AND CONCEPT LEARNING
Project 108

Principal Investigator:
Bruce H. Westley, Professor of Journalism

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Severin, W. Cue summation in multiple-channel communication. Technical Report No. 37. 12 pp. January 1968. ED 021 463.

The performance of seventh grade pupils on a simple word-recognition task is observed in order to determine the relative effectiveness of providing auditory or visual cues or both combined to be either redundant or interfering cues. The results increase our knowledge of the conditions under which multiple-channel communication provides the maximum amount of information transmission.

REHABILITATION OF DISADVANTAGED YOUTH IN RESPECT TO BASIC EDUCATIONAL AND SOCIAL SKILLS
Project 109

Principal Investigator:
Robert E. Grinder, Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Askov, W. H. Cognitive style and social responsibility: An empirical study of an instrument for assessing high school students' sense of responsibility. Technical Report No. 90. (Master's thesis) 138 pp. July 1969. ED 035 958.

The purpose of this study was to explore whether differences exist between competent and incompetent high school students in their styles of thinking and in their attitudes toward what they consider to constitute socially responsible behavior. (The term "social responsibility" was defined, for the purpose of this study, as the ability to anticipate the consequences of one's own behavior.) Apart from ability, scholastic drop-outs and underachievers share many characteristics that distinguish them from their more persistent classmates.

MOTIVATION AND CONCEPT LEARNING
Project 110

Principal Investigator:
Thomas J. Johnson, Assistant Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Baldwin, T. L., & Johnson, T. J. *Teacher behaviors and effectiveness of reinforcement*. Technical Report No. 9. 22 pp. 1966. ED 010 511.

The effects of variations in two aspects of teacher behavior--punitiveness and expertise--are reported. The methodology developed for this experiment might be used to assess the varied effects of a number of teacher behaviors.

STRUCTURE OF CONCEPT ATTAINMENT ABILITIES
Project 111

Principal Investigators:
- Robert Davidson, Associate Professor of Educational Psychology
- Herbert J. Klausmeier, V.A.C. Henmon Professor of Educational Psychology
- Thomas A. Romberg, Associate Professor of Curriculum and Instruction
- B. Robert Tabachnick, Professor of Curriculum and Instruction Educational Policy Studies
- Alan Voelker, Assistant Professor of Curriculum and Instruction
- Lester S. Golub, Lecturer, English and Curriculum and Instruction

Project Manager:
- Margaret Harris, Research Associate

Program Director:
- Mary R. Quilling, Quality Verification

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Robinson, P. E. Two fifth grade measures of cognitive abilities. Technical Report No. 135. (Master's thesis) 94 pp. June 1970. Ed 043 086.

Two fifth grade measures of the ability to deal with symbolic relationships were developed for use in further factor analytic research concerning the nature of intelligence. Circle reasoning was adapted from an adult-level test by modifying the number of symbols and the nature of the principles on which the items were based.

Item analysis results suggested that the four major categories of relationships formed a continuum of difficulty according to the complexity of symbolic relations. Evidence of a learning set effect provided questions for future research.

Other papers produced by this project are listed under Conditions of School Learning and Instructional Strategies. They are Technical Reports No. 191, 192, 193, 194, 195, 196, 197, 198, 199, and 200, and Theoretical Papers No. 33 and 34.

INDIVIDUALLY GUIDED ELEMENTARY MATHEMATICS

Project 201--Phase 1

Patterns in Arithmetic

Principal Investigators:
Henry Van Engen, Emeritus Professor of Mathematics and Curriculum and Instruction
Thomas A. Romberg, Associate Professor of Curriculum and Instruction

Project 201 has been phased into Research Component 5.1.20: Conditions of School Learning and Instructional Strategies.

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Boe, B. L. *Secondary school pupils´ perception of the plane sections of selected solid figures*. Technical Report No. 13. (Ph.D. dissertation) 33 pp. November 1966. ED 010 515.

Seventy-two subjects representing three ability levels in each of Grades 8, 10, and 12 were individually given two tests, differing only in mode of response, of geometric sections resulting from four cuts hypothetically performed on each of four solid figures. Sex, grade, ability level, and sequence of tasks were used in the analysis of responses to the two tests.

Braswell, J. S. *The formative evaluation of Patterns in Arithmetic*--*Grade 6, using item sampling*. Parts I, II, III. Technical Report No. 113. (Ph.D. dissertation) 237 pp. in 3 vols. March 1970. ED 040 877.

The major goal of this study was to determine whether the technique of "item sampling" could be incorporated into a design effective for formative curriculum evaluation. Three sub-goals were (1) to explore the practical relationship between the population and item parameters, (2) to discuss ways formative curriculum evaluation can be used, and (3) to suggest advantages item sampling has over traditional achievement testing.

Braswell, J. S., & Romberg, T. A. *Objectives of Patterns in Arithmetic and evaluation of the telecourse for grades 1 and 3*. Technical Report No. 67. Revised edition 1971. 78 pp. January 1969.

Part One of this report discusses the background and philosophy of the *Patterns in Arithmetic* (PIA) TV program. Part Two presents the results of a summative noncomparative evaluation done on PIA Grades 1 and 3 during the 1966-67 school year.

Harper, E. H., & Steffe, L. P. The effects of selected experiences on the ability of kindergarten and first grade children to conserve numerousness. Technical Report No. 38. Out of print. 45 pp. February 1968. ED 021 752.

This study tests the effects of a sequence of twelve lessons on the ability of kindergarten and first grade children to recognize and conserve numerousness. Two pretests were administered to each grade level.

Kriewall, T. E. Applications of information theory and acceptance sampling principles to the management of mathematics instruction. Technical Report No. 103. (Ph.D. dissertation) Out of print. 285 pp. in 2 vols. October 1969. Vol. 1: ED 038 306. Vol. 2: ED 038 307.

This publication treats several problems of instructional management encountered in situations which emphasize self-selection and self-pacing principles. Primarily, these problems deal with the efficient utilization of available resources to create an operational, individualized, inquiry-learning environment.

LeBlanc, J. F. The performances of first grade children in four levels of conservation of numerousness and three I.Q. groups when solving arithmetic subtraction problems. Technical Report No. 171. (Ph.D.dissertation) 189 pp. November 1971. ED 079 925.

This study concerns the performances of first grade children in solving problems involving subtraction situations and the relationship of these performances to levels of conservation of numerousness and to I.Q. groups. The children were categorized into levels of conservation by a pretest administered prior to the main test of problem solving in subtraction. The children were also divided into I.Q. groups so that an analysis of the relationships among all three factors could be made; that is, among the problem-solving test, the levels of conservation of numerousness, and the I.Q. groups. Further, the effects of aids and transformations on the performances of the children in the problem-solving test were examined.

The pretest of conservation of numerousness was found to be a better predictor of success in problem solving than the group I.Q. test. Further, there was an indication that children in the low levels of conservation of numerousness and the low I.Q. group were more dependent on aids and transformations in solving subtraction problems. The relationship between the results of the problem-solving test and the number facts test is such that it is clear that knowledge of number facts is not sufficient for children's success in problem solving.

Leffin, W. W. A study of three concepts of probability possessed by children in the fourth, fifth, sixth, and seventh grades. Technical Report No. 170. (Ph.D. dissertation) 264 pp. September 1971. ED 070 657.

This study examined the status of three concepts, basic to fundamental notions of probability, possessed by 528 children in grades four through seven. The three concepts included in this investigation were: points of a finite sample space, probability of a simple event in a finite sample space, and quantification of probabilities. Three tests, one for each of the three concepts, were constructed by the writer for use in this study. Each test consisted of a set of items for which the child's responses would indicate if he/she could apply the concept in a variety of simple experiment and game situations.

A multivariate analysis of covariance was performed on the results of the three tests. Grade equivalent scores on the three parts of the Stanford Arithmetic Achievement Test were used as covariates. The overall mean performances, adjusted for the covariates, were significantly different (p less than .01) among I.Q. groups, sex groups and grades. There were no significant interactions.

The most significant outcome of this study is that the children demonstrated that they had acquired considerable knowledge about the three concepts of probability under investigation and could apply these concepts in a variety of situations. These children had not received formal training on the notion of probability, so their understanding and ability to apply these concepts must have developed as a result of their background, experience and intuition. Since young children acquire some knowledge of probability outside of school, it seems reasonable to assume that some topics of probability would not be too difficult to include in the elementary school program.

Marshall, J. L., & Fischbach, T. J. Evaluation of Patterns in Arithmetic in Grades 1-4, 1970-71: Effects on teachers. Technical Report No. 225. 99 pp. March 1972. ED 065 315.

A large-scale, summative, comparative evaluation of Patterns in Arithmetic, a modern televised arithmetic curriculum for Grades 1-6, was carried out in Grades 1-4 in both rural and urban schools during the 1970-71 school year. This report deals with the ways in which PIA affects teachers: in basic mathematical knowledge, knowledge of PIA-specific content, and attitudes toward teaching arithmetic. Findings indicate that PIA can be used effectively as inservice education, particularly for those teachers with relatively lower initial knowledge of the basic mathematics which underlies a contemporary elementary school mathematics program. PIA does not seem to change teachers' attitudes, however; nor is it beneficial in increasing knowledge of concepts not specifically related to PIA.

These results seem to hold equally for both rural and urban schools.

Steffe, L. P. The performance of first grade children in four levels of numerousness and three I.Q. groups when solving arithmetic addition problems. Technical Report No. 14. Out of print. (Ph.D. dissertation) 57 pp. December 1966. ED 016 535.

By using a test of conservation of numerousness he developed, the author was able to separate first grade children in each of three I.Q. groups into four levels of conservation of numerousness. Variables of a described transformation versus no described transformation of sets and of no aids, pictorial aids, and physical aids in addition problems were studied, and a test of addition facts was also conducted. Correlations indicated that excellent predictions of relative success in solving addition problems and learning addition facts can be made for children entering first grade.

Steffe, L. P. _The effects of two variables on the problem-solving abilities of first grade children_. Technical Report No. 21. Out of print. 17 pp. March 1967. ED 019 113.

In the reported research, first grade children using three different arithmetic programs were individually tested on addition problems. Half of the problems each child received had different names for the sets to be combined and for the total set; half of the children received problems preceded by a quantifier.

Steffe, L. P., & Parr, R. B. _The development of the concepts of ratio and fraction in the fourth, fifth, and sixth years of the elementary school_. Technical Report No. 49. Out of print. 43 pp. March 1968. ED 023 612.

Six tests were constructed, four on a pictorial level and two on a symbolic level, to measure the performance of children in three different ability groups on problems which may be classified as ratios or fractions. The authors suggest a number of steps that may be taken to develop appropriate abilities in children.

Van Engen, H., & Steffe, L. P. _First grade children's concept of natural numbers_. Technical Report No. 5. Out of print. 13 pp. February 1966. ED 010 508.

A concern with relationships among variables pertaining to learners and a particular subject matter--arithmetic--prompted the study described in this report. Specifically, relationships of sex and I.Q. level to the acquisition of the concepts of addition and of conservation of numerousness were ascertained.

A SYSTEM OF INDIVIDUALLY GUIDED INSTRUCTION: ENGLISH LANGUAGE, COMPOSITION, AND LITERATURE
Project 202

Principal Investigators:
Robert C. Pooley, Retired Professor of English
Nathan S. Blount, Professor of English and of Curriculum and Instruction
Lester S. Golub, Lecturer, English and Curriculum and Instruction

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Blount, N. S., Fredrick, W. C., & Johnson, S. L. *The effect of a study of grammar on the writing of eighth grade students*. Technical Report No. 69. 44 pp. December 1968. ED 036 515.

A test of programmed materials in structural and transformational grammar was administered to eighth graders in two schools. Writing samples of 1,000 words were obtained from all subjects prior to and after the experiments.

Blount, N. S., Fredrick, W. C., & Johnson, S. L. *Measures of writing maturity from two 500-word writing samples*. Technical Report No. 97. 9 pp. September 1969. ED 036 522.

The purpose of this study was to estimate the reliability of various measures of writing behavior using 500-word samples instead of 1,000 words. The themes of 135 eighth graders were collected over a period of six weeks. Themes written during the first three weeks were compared to those of the second three weeks.

Blount, N. S., Johnson, S. L., & Fredrick, W. C. *A comparison of the writing of eighth and twelfth grade students*. Technical Report No. 78. 30 pp. April 1969. ED 035 652.

In each grade, 16 boys and 16 girls were equally distributed into two ability groups on the basis of standardized IQ test scores. Differences between boys and girls and between high and average levels were not significant on any measure.

Blount, N. S., Klausmeier, H. J., Johnson, S. L., Fredrick, W. C., & Ramsay, J. G. *The effectiveness of programed materials in English syntax and the relationship of selected variables to the learning of concepts*. Technical Report No. 17. 52 pp. January 1967. ED 013 256.

This report gives the results of (1) field testing and possibly improving instructional materials in structural and transformational grammar through analysis of (a) the students' comments on individual frames of the material, (b) error rates, (c) the varying amounts of time required by students to complete the lessons, and (d) students' absolute gains from pretest to posttest; and (2) experiments to extend knowledge about variables related to efficiency of learning concepts, the more specific variables being sex and IQ level of the students, advance organizer, review of material, negative instances of concepts, informative feedback, and writing exercises.

Fredrick, W. C., Blount, N. S., & Johnson, S. L. *A comparison of verbal statement, symbolic notation, and figural representation of grammar concepts*. Technical Report No. 64. 19 pp. October 1968. ED 029 892.

The importance of three modes of representation in presenting a series of grammar concepts was investigated. One mode was entirely verbal, the second was based on a symbolic notation, and the third was based on diagrams. Each mode was tested with 72 eighth grade subjects of high, medium, and low ability. The experiment seemed to show that the teaching of verbal concepts is facilitated by appropriate symbols and diagrams, provided the subjects understand these nonverbal materials.

Pooley, R. C., & Golub, L. S. *Concepts and objectives for learning the structure of English in Grades 7, 8, and 9*. Theoretical Paper No. 22. Out of print. 23 pp. November 1969. ED 038 421.

This outline of concepts for learning the structure of English attempts to set down in logical order the basic concepts involved in the recognition and understanding of the English language. It emphasizes the behavioral and social aspects of language as the foundation for instruction.

PROTOTYPIC INSTRUCTIONAL SYSTEMS: THE TEACHING AND LEARNING OF CONCEPTS IN VERBAL ARGUMENT

Project 205

Principal Investigator:
Ronald R. Allen, Professor of Communication Arts and of Curriculum and Instruction

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Allen, R. R., Feezel, J. D., & Kauffeld, F. J. *A taxonomy of concepts and critical abilities related to the evaluation of verbal arguments*. Occasional Paper No. 9. Out of print. 36 pp. August 1967. ED 016 658.

The purpose of this paper is to identify concepts and clusters of concepts which adequately define what knowledge a student must possess if he/she is to critically evaluate everyday discourse.

Allen, R. R. *Terminal report from the Concepts in Verbal Argument Project*. Theoretical Paper No. 35. 15 pp. December 1971.

This terminal report summarizes nine phases of research and development activity of the Concepts in Verbal Argument Project: survey of the literature of critical thinking, identification of sequences of concepts and cognitive abilities, development of measuring instruments, factor analytic study of measuring instruments, normative study of student critical thinking abilities, development of instructional materials, field test of instructional materials, study of the effect of qualifiers on the acceptability of claims, and preparation of project reports. Special attention is given to the methodology and findings of studies related to test development and validation, establishment of norms for student critical thinking abilities, development and testing of programmed learning materials, and the effect of qualifiers in reason statements on the acceptability of claims.

This report is intended to serve as a final general overview of the project. The reader wishing a comprehensive review of the project will wish to read the 12 other research and development documents produced by project personnel.

Allen, R. R., Feezel, J. D., & Kauffeld, F. J. *The Wisconsin Tests of Testimony and Reasoning Assessment (WISTTRA)*. Practical Paper No. 6. Out of print. 41 pp. January 1969. ED 036 863.

This paper has two main subdivisions: Evaluation of Testimony and Evaluation of Reasoning. Test keys and time estimates are given in the appendixes.

Allen, R. R., Feezel, J. D., Kauffeld, F. J., & Harris, M. L. The development of the Wisconsin Tests of Testimony and Reasoning Assessment (WISTTRA). Technical Report No. 80. Out of print. 37 pp. April 1969. ED 036 521.

This paper reports the development of a test battery for measuring student mastery of certain verbal skills basic to critical thinking. The particular data presented were gathered by an administration of the fifth edition of the test battery to over 3,000 junior/senior high students in four Wisconsin school systems.

Allen, R. R., & Rott, R. K. The nature of critical thinking. Theoretical Paper No. 20. Out of print. 19 pp. May 1969. ED 036 861.

The present paper attempts to sort out direct attempts at defining critical thinking. Such definitions are classified by three differing points of view: critical thinking as evaluation, critical thinking as problem solving, and critical thinking as a pluralistic act.

Feezel, J. D. The effect of verbal qualification of argument reasons upon acceptance of the derived claim. Technical Report No. 167. (Ph.D. dissertation) 126 pp. June 1971. ED 057 400.

This is a report on research comparing qualified and unqualified statements to determine how they function in the reasons of arguments to affect receiver acceptance of argument conclusions. Nine qualifiers were studied: "certainly, it is certain, I know, probably, it is likely, I believe, possibly, it is possible, I suspect." The qualifiers were placed on reasons in arguments with three variations in location (on data, on warrant, or both). Subjects were eleventh grade students.

The major conclusions were as follows: (1) Certainty degree words effected stronger conclusions than the other qualifiers, but unqualified statements are as strong as or stronger than certainty statements. (2) Word forms of qualifiers interact with degree in complex ways, with personal thought forms tending to be the stronger. (3) "Probably" has an ambiguous meaning between likely and possible degrees. (4) Content and logic factors influence different results for qualifiers in argument from the words viewed in isolation. (5) Though there is some stability in repeated responses, there are also individual variations and inconsistency of response by many students who tend to be the less intelligent and less able readers.

Harris, M. L. A factor analytic study of the Wisconsin Tests of Testimony and Reasoning Assessment (WISTTRA). Technical Report No. 100. Out of print. 37 pp. October 1969. ED 038 405.

Subject matter specialists in speech developed a taxonomy of concepts and abilities related to verbal argument as used in ordinary discourse. It was the purpose of this study to use data collected to assess these hypothesized abilities to determine, using factor analytic procedures, the construct validity of the taxonomy.

Rott, R. K., Feezel, J. D., Allen, R. R., & Harris, M. L. Student abilities in the evaluation of verbal argument: A normative study. Technical Report No. 106. Out of print. 27 pp. November 1969. ED 038 404.

During this study, a battery of seven tests, known collectively as the Wisconsin Tests of Testimony and Reasoning Assessment (WISTTRA), was administered to more than 3,000 participating subjects.

CONCEPTS IN POLITICAL SCIENCE
Project 206

Principal Investigtor:
Jack Dennis, Professor of Political Science

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Dennis, J. With the assistance of I. H. Bromall and M. C. Tropp. A survey and bibliography of contemporary research on political learning and socialization. Occasional Paper No. 8. 23 pp. April 1967. ED 013 979.

The extensive bibliography is introduced with a survey of political socialization research. Ten basic problem dimensions are identified and illustrated with existing empirical hypotheses.

Dennis, J. Terminal report of the political learning project. Theoretical Paper No. 19. 6 pp. April 1969. ED 037 472.

This terminal report summarized the four major activities of the political learning project.

Dennis, J. Political learning in childhood and adolescence: A study of fifth, eighth, and eleventh graders in Milwaukee, Wisconsin. Technical Report No. 98. Out of print. 91 pp. October 1969. ED 040 117.

The present study utilizes the interview responses of 297 fifth-, eighth-, and eleventh-grade children and 205 of their parents to analyze patterns of political learning before and after adolescence.

Dennis, J., Billingsley, K. R., & Thorson, S. J. A pilot experiment in early childhood political learning. Technical Report No. 63. Out of print. 30 pp. September 1968. ED 043 368.

This study is a pilot experiment in early childhood learning designed to gain information about whether young children are able to comprehend the basic political concepts as part of an interconnected set of concepts about political phenomena.

PROJECT MODELS
Project 301

Principal Investigators:
Herbert J. Klausmeier, V.A.C. Henmon Professor of Educational Psychology
Richard G. Morrow, Assistant Professor of Educational Administration

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Cook, D. M., Wardrop, J. L., Tagatz, G. E., Quilling, M., Kamla, D., & Shuman, E. *Research and development activities in R & I Units of two elementary schools of Janesville, Wisconsin, 1966-1967*. Technical Report No. 45. Out of print. 17 pp. March 1968. ED 023 175.

Results of two controlled experiments conducted in the units are reported and evaluated. One study, in which four methods of teaching arithmetic to first graders were compared, led to the suggestion that techniques be selected specifically for the concept being taught.

Klausmeier, H. J., Cook, D. M., Goodwin, W. L., Tagatz, G. E., & Pingel, L. *Individualizing instruction in language arts through development and research in R & I Units of local schools, 1965-1966*. Technical Report No. 19. Out of print. 25 pp. February 1967. ED 013 255.

R & I (research and instruction) Units, first established in schools in spring 1966, are described as organizations that facilitate research and development on cognitive learning in schools. Eight experiments--one in spelling, two in handwriting, and five in reading--conducted in some of the first units are reported.

Klausmeier, H. J., Goodwin, W. L., Prasch, J., & Goodson, M. R. With an introduction by W. G. Findley. *Project MODELS: Maximizing opportunities for development and experimentation in learning in the schools*. Occasional Paper No. 3. Out of print. 29 pp. July 1966. ED 010 214.

Following the introduction relating the need for new approaches in educational research to the R & D Center's program, the authors describe (1) the project's origin and rationale including the concepts of learning specialist and R & I Units in local schools, (2) the sophisticated research possible in the units, (3) contributions of the R & I Units to the solution of local educational problems, and (4) a related investigation of the process of change in the schools.

Klausmeier, H. J., & Quilling, M. (Eds.) *Research and development activities in R & I Units of four elementary schools of Madison, Wisconsin, 1966-1967*. Technical Report No. 48. Out of print. 24 pp. April 1968. ED 021 696.

Individualization and motivation were the focal points of these research and development activities in R & I Units in four Madison, Wisconsin, elementary schools. Special attention was given to language arts.

Klausmeier, H. J., Quilling, M., & Wardrop, J. L. (Eds.) *Research and development activities in R & I Units of five elementary schools in Racine, Wisconsin, 1966-1967*. Technical Report No. 52. Out of print. 44 pp. April 1968. ED 023 076.

Among the significant findings of the several experiments performed in five elementary schools of the Racine Unified School District are that a well-planned language enrichment program for disadvantaged kindergarten children improves their communication skills, extensive home-school contacts result in improved parental attitudes toward the school and better achievement by students, and feedback provided by teacher-pupil conferences and a mastery checklist results in superior performance in arithmetic.

Morrow, R. G., Quilling, M. R., & Fox, F. *Student achievement and attitudes in Instruction and Research Units in two elementary schools in Janesville, Wisconsin, 1967-1968*. Technical Report No. 76. Out of print. 23 pp. February 1969.

The multiunit organizational plan for elementary schools and its basic element, the Instruction and Research Unit, is concerned with developing an environment in local schools and school systems which facilitates individually guided learning by students, research and development activities, and the inservice development of teachers.

Quilling, M., Cook, D. M., Wardrop, J. L., Klausmeier, H. J., Baldwin, R., & Loose, C. *Research and development activities in R & I Units of two elementary schools of Milwaukee, Wisconsin, 1966-1967*. Technical Report No. 46. Out of print. 17 pp. March 1968. ED 020 911.

Activities of R & I (research and instruction) Units in two Milwaukee schools during the 1966-1967 school year are reviewed. Results of two controlled experiments conducted in the units are reported and evaluated. In one study, although no significant difference was found between two methods of teaching arithmetic to fourth graders, both groups of students made progress as great as or greater than their average rate of progress since entering school. First graders who had sixth grade helpers in arithmetic performed significantly better than pupils who did not have helpers.

Wardrop, J. L., Cook, D. M., Quilling, M., Klausmeier, H. J., Espeseth, C., & Grout, C. *Research and development activities in R & I Units of two elementary schools of Manitowoc, Wisconsin, 1966-1967*. Technical Report No. 35. Out of print. 8 pp. November 1967. ED 019 796.

In addition to discussing activities of the R & I Units, this report describes controlled experiments conducted in third grade arithmetic and fourth grade spelling instruction.

MODELS FOR EFFECTING PLANNED EDUCATIONAL CHANGE
Project 302

Principal Investigators:
Max R. Goodson, Professor of Educational Policy Studies
Burton W. Kreitlow, Professor of Educational Policy Studies and of Agricultural and Extension Education
Warren O. Hagstrom, Professor of Sociology and of Educational Policy Studies

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Goodson, M. R., & Hagstrom, W. O. Changing schools: Case studies of change-agent teams in three school systems. Technical Report No. 177. 53 pp. August 1971. ED 058 664.

Change within a school system is often inhibited by a lack of systematic planning, inadequate communications, and a lack of coordination of efforts among persons who make up the school system. The paper deals with an approach to school system change--the establishment of a change-agent team to plan for and manage specific changes and to facilitate and perpetuate an innovative climate. It presents case studies of change-agent teams in three Wisconsin school systems.

A model for change-agent team planning and action which includes diagnosing problems, planning strategies, transforming strategies into action, and evaluating results is described. Elements of Human Development Laboratory training given to change-agent team members and others within the school systems are presented. These include descriptions of dialogue groups, focused exercises, and concepts used at the sessions as well as actual training designs. The activities of change-agent teams and their colleagues are related, and an evaluation of the interventions based on systematic data is included. The report concludes with recommendations and suggestions for future efforts.

Goodson, M. R., & Hammes, R. A team designed for school system changing. Theoretical Paper No. 11. Out of print. 26 pp. February 1968. (Reprint May 1969) ED 023 162.

This paper is based upon the premise that the problems of changing a school system require a systematic approach that coordinates various efforts within the system. A team is expected to plan for and manage specific changes as well as to facilitate an innovative climate in a school system.

Hagstrom, W. O., & Gardner, L. L. H. Characteristics of disruptive high school students. Technical Report No. 96. Out of print. 24 pp. September 1969. ED 035 961.

This report contrasts the characteristics of high school students with disorderly histories and those without such histories.

Hilfiker, L. R. The relationship of school system innovativeness to selected dimensions of interpersonal behavior in eight school systems. Technical Report No. 70. Out of print. 67 pp. January 1969. ED 029 808.

The relationship between school system innovativeness and selected dimensions of interpersonal behavior is examined in eight school systems.

Hilfiker, L. R. A profile of innovative school systems. Technical Report No. 172. 69 pp. August 1971. ED 069 041.

An earlier report examined the relationship of school system innovativeness to selected dimensions of interpersonal behavior in eight school systems as revealed through data collected in 1967. The major implication of this study suggested that the climate of the schools might be changed to make them more receptive to innovation from within or without the systems.

The study replicates portions of the 1967 study and has two additional objectives: relating findings to organizational models and delineating characteristics of an innovative school system. Replication is presented of the manner in which innovativeness as a dependent variable is related to specified independent variables.

Kreitlow, B. W. Basic explorations in adult re-education. Theoretical Paper No. 25. 9 pp. April 1970. ED 042 991.

In a study designed to generate hypotheses for explorations for research in adult re-education, more attention is given to the discovery of promising leads than to the derivation of conclusive evidence. The phenomena of concept attainment, symbol manipulation, verbal behavior, differential instruction, and awareness levels were studied. Attentional involvement in the concept attainment process was not satisfactorily measured. The symbol manipulation process of literate and illiterate adults varied sufficiently to suggest further testing. The verbal behavior of lower-class rural adult women was distinctly limited when compared with middle-class rural women in the same community. This suggested investigation of differentiated programs of instruction. A design for manipulating the instructional variables was developed for possible use in dealing with variability in the "awareness stage" of learning.

Kreitlow, B. W. Evaluating the influence of change-agent teams on the order of change processes of school systems: A test of the Model for Educational Improvement. Technical Report No. 214. 21 pp. February 1972. ED 064 808.

The Model for Educational Improvement is a theoretical construct which combines some well-known elements of the change process in a new configuration. The model was developed as a result of an exploratory investigation within the Planned Change Project; it deals with both external factors and the internal structure of a school system and demonstrates the route through which an innovation moves toward adoption. This part of the investigation deals with school systems using change-agent teams as a vehicle for educational improvement and compares them to other school systems without such teams.

Findings revealed little evidence that the presence of change-agent teams made any difference in perception, emphasis, responsibility, or influence in relation to the improvement process in a school system. Of special concern was the ancillary finding that school staffs have limited knowledge of the process of adoption in their own school system. This was identified as the "level of ignorance" and showed that from 32 percent to 73 percent of the staff knew little of the process by which a major innovation was adopted in their own school system.

Kreitlow, B. W., & MacNeil, T. An evaluation of the Model for Educational Improvement as an analytical tool for describing the change process. Theoretical Paper No. 18. Out of print. 17 pp. March 1969. ED 030 197.

This paper describes the structure of the Model for Educational Improvement. It reports on an informal test of the hypothesis that the model is a valid description of the change process within a school system. Data for this test are provided through tape recordings and occasional observations of meetings of change-agent teams operating in three school systems.

Kreitlow, B. W., & MacNeil, T. A model for educational improvement in extension. Theoretical Paper No. 26. 8 pp. April 1970. ED 013 979.

The authors propose that the Model for Educational Improvement is a suitable instrument for describing the change process within the context of university extension systems. Originally designed to describe the flow of the change process in school systems, the model is generalized here to describe the flow of the change process in an extension system. In doing so an assumption is made that extension is also an open system, with a specific internal structure, where an observable improvement process occurs. The model permits an idea to be traced from the point where it enters the system to where it becomes part of the organization´s action program.

Kreitlow, B. W., & MacNeil, T. The school board and a model for educational improvement. Practical Paper No. 10. 7 pp. April 1970. ED 043 971.

The introduction of improvements in school systems requires knowledge of how change takes place. The authors propose the Model for Educational Improvement as an instrument for describing the process of change in school systems. This model is a composite of ideas derived from the findings of researchers in the fields of agriculture and education and from the authors' observations of the change process in five Wisconsin school districts.

LONGITUDINAL STUDY OF EDUCATION EFFECTIVENESS OF REORGANIZED SCHOOL DISTRICTS
Project 303

Principal Investigator:
Burton W. Kreitlow, Professor of Educational Policy Studies and of Agricultural and Extension Education

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Kreitlow, B. W. Long-term study of educational effectiveness of newly formed centralized school districts in rural areas. Technical Report No. 133. 84 pp. April 1971. ED 048 884.

The prime objective of this study was to determine whether or not newly reorganized rural school districts were more effective than the smaller districts they replaced. Five experimental and five control communities were in the sample.

This investigation was longitudinal in design and examined two groups of subjects from their first year in school until five years after their high school graduation. The longitudinal nature of the investigation made possible the pursuit of two related objectives. The first dealt with a determination of the effectiveness of the 4-H Club program in the ten study communities and the second examined the effectiveness of different means of disseminating the research results to the rural public.

Selected findings related to each of the above objectives are: Reorganized school districts provided more learning opportunities; the students had consistently higher achievement-test scores and completed high school with a 6- and a 13-month advantage in mental maturity for boys and girls, respectively. The reorganized distict also leads to a higher matriculation in college after high school. Boys from nonreoganized districts scored higher on measures of social adjustment than those in reorganized districts.

4-H Clubs attracted youths from the higher income and social status families with a higher average intelligence and from families previously involved in the program. 4-H members showed no personal and social adjustment advantages.

ADULT RE-EDUCATION
Project 601

Principal Investigator:
Burton W. Kreitlow, Professor of Educational Policy Studies
and of Agricultural and Extension education

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Boyd, R. D. The psychological and mythmaking phenomena in visual symbolization of adult illiterates. Technical Report No. 93. 19 pp. August 1969. ED 034 962.

This pilot study was a limited exploratory investigation which examined certain aspects of visual symbolization ability of matched pairs of literate and illerate adults.

Kreitlow, B. W. Educating the adult educator: Part 2. Taxonomy of needed research. Theoretical Paper No. 13. Out of print. 20 pp. May 1968. ED 023 031.

This theoretical paper is the concluding part of an extensive examination of the problem of educating adult educators. The first part deals with the relationship of adult education to other disciplines. This part establishes a framework for classifying areas of needed research in the field of adult education.

CULTURALLY DISADVANTAGED
Project 701

Principal Investigator:
Julian C. Stanley, Professor of Educational Psychology

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Biaggio, A. M. B. *Relative predictability of freshman grade-point averages from SAT scores in Negro and white southern colleges*. Technical Report No. 7. (Master's thesis) 31 pp. 1966. ED 010 509.

A comparison of the accuracy of prediction of freshman grades in Negro and non-Negro colleges, via SAT-verbal and SAT-mathematical scores, is described in this report. Correlations between predictors and freshman grade-point averages are compared through a three-factor analysis of variance singly-nested design.

ENVIRONMENTAL EDUCATION
5.2.35

Project Director:
Jan T. Jeter

Associate Scientist:
Elaine Anderson

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Agin, M. L. The feasibility of teaching science via a socio-historical approach. Technical Report No. 303. (Ph.D. dissertation) 5.2.35.10.01.02.02. 176 pp. June 1973. ED 102 015.

The purpose of this study was to determine the feasibility of teaching science via a socio-historical approach utilizing selected concepts related to the social and historical developments of science and selected concepts related to atomic energy. Three criteria were used to assess the success of the approach: (1) a significant increase in subject matter knowledge, (2) a high level of student interest toward the socio-historical approach, and (3) an increase in student understanding of knowledge related to science and scientists, science-society interrelationships, and the atom and atomic energy.

A 90-item multiple choice test, administered as a pretest and posttest to both groups, yielded three subtest scores--science and scientists, science-society interrelationships, and the atom and atomic energy--and a total score for each student. Mean gains for the subtests and total test were tested statistically and found to be significant.

Responses to a questionnaire indicated that a majority of the students expressed a positive opinion toward the interest producing potential of the unit. In addition, a majority of the students felt that the unit increased their understanding of the three topics. It was concluded that teaching via a socio-historical approach is feasible since the performance of the students met the criteria for acceptance.

See Practical Paper No. 303 for the related classroom materials.

Boles, R. J. The feasibility of teaching biology via the sociohistorical approach. Technical Report No. 66. 34 pp. November 1968. ED 065 362.

The exploratory study described in this technical report was an attempt to determine the feasibility of teaching science concepts to high school students through instruction on the relationship of science and society or the social implications of science.

Carey, R. L. *Lesson plans and tests of knowledge, comprehension, and application for selected concepts of the conceptual scheme "The Particle Nature of Matter."* Practical Paper No. 1. Out of print. 39 pp. January 1968.

These materials were developed for use in an empirical study to determine the relative levels of understanding of certain concepts within the conceptual scheme "The Particle Nature of Matter" achieved by pupils in Grades 2-5.

Carey, R. L. *Relationship between levels of maturity and levels of understanding of selected concepts of "The Particle Nature of Matter."* Technical Report No. 36. Out of print. 68 pp. January 1968. ED 020 131.

The purpose of this study was to determine the relative levels of understanding of certain concepts achieved by pupils in Grades 2-5. Sixteen concepts were selected and ordered with reference to the logic of the discipline.

Helgeson, S. L. *Lesson plans and tests of knowledge, comprehension, and application for instruction in concepts of force, Grades 2-6.* Practical Paper No. 4. 39 pp. March 1968. ED 020 907.

The study for which the lessons and tests in this practical paper were developed indicated that pupils in Grades 2-6 are able to learn, at varying levels of understanding, selected concepts of force.

Helgeson, S. L. *The relationship between concepts of force attained and maturity as indicated by grade levels.* Technical Report No. 43. 43 pp. March 1968. Ed 020 910.

Demonstration discussion techniques were utilized to instruct pupils in Grades 2-6 in concepts related to the conceptual scheme of force. Lesson plans and tests utilized in this study are available in Practical Paper No. 4.

Pella, M. O., Green, R. A., Doran, R. L., & Roy, R. *Teaching the conceptual scheme "The Particle Nature of Matter" in the elementary school.* Technical Report No. 173, issued with accompanying Practical Paper No. 173, *Classroom materials for teaching "The Particle Nature of Matter."* 59 pp. and 209 pp. July 1971.

The purpose of this project was to develop a series of lessons and associated materials (tests, demonstrations, pupil activities, etc.) related to teaching concepts included in the scheme "The Particle Nature of Matter" for Grades 2 through 6. The hypothesis that served as the base for development is "theoretical concepts related to the particle nature of matter can be learned by pupils in Grades 2 through 6 when analogous mechanical models comprehensible to pupils of these ages are employed." The intent was to present abstract ideas in concrete terms.

The usability of the materials and strategies and the feasibility of teaching the concepts were judged against criteria including pre- and posttest scores of experimental and control groups, teacher opinions, and pupil opinions. The criteria were met by essentially all concepts at all grade levels. The hypothesis appears to possess some credibility and the materials developed are usable in the hands of regular classroom teachers. Pupils in Grades 2 through 6 appear to be interested in learning the particle theory of matter and in participating in theory development using analogous mechanical models.

The practical paper presents the lesson plans and tests used in the research study, together with descriptions of models and films developed for the teaching program.

Pella, M. O., & Ziegler, R. E. *The use of static and dynamic mechanical models in teaching aspects of the theoretical concept "The Particle Nature of Matter*." Technical Report No. 20. Out of print. 50 pp. March 1967. ED 013 205.

Through the use of mechanical models a basic concept of science, "The Particle Nature of Matter," was effectively taught to children in Grades 2-6. The relationships of IQ, grade level, age, and past achievement in science and mathematics were ascertained through analysis of responses to eight test demonstrations given after instruction.

Roth, R. E., Pella, M. O., & Schoenfeld, C. A. *Environmental management concepts--A list*. Technical Report No. 126. 72 pp. April 1970. ED 045 376.

A survey to validate environmental management education concepts discovered no clear-cut bias evident due to either professional area or ecological region. Individual differences of opinion were found among the scholars in the survey from 40 professional areas and 12 ecological regions of the United States, although they agreed on the majority of concepts to be emphasized in environmental management education.

Sherman, J. E. *The relative effectiveness of two methods of utilizing laboratory-type activities in teaching introductory physical science*. Technical Report No. 65. Out of print. 29 pp. November 1968. Ed 065 361.

This study was concerned with determining the relative effectiveness of a direct manipulative and an indirect nonmanipulative method of utilizing laboratory-type activities in teaching Introductory Physical Science.

Stauss, N. G. *Materials used in teaching and evaluating the concepts related to the biological cell in Grades 2-6*. Practical Paper No. 2. 36 pp. January 1968. ED 020 152.

The focus of this study was the identification of the concepts included within the conceptual scheme "The Biological Cell" most appropriate for study by children in Grades 2-6. For an investigation into children's learning of these concepts, lessons and tests were developed.

Stauss, N. G. An investigation into the relationship between concept attainment and level of maturity. Technical Report No. 40. Out of print. 65 pp. February 1968. ED 020 152.

The focus of this study was the identification of the concepts included within the conceptual scheme "The Biological Cell" most appropriate for study by children in Grades 2-6. The grades in which satisfactory mastery of 11 specific concepts was attained are outlined.

Swartney, I. J. Learning difficulties encountered by students studying the CHEM study program. Technical Report No. 77. (Ph.D. dissertation) Out of print. 101 pp. ED 036 445.

This study was designed to identify those science concepts and mathematical skills that may be the source of student difficulty in learning chemistry as described by the CHEM study program.

Thompson, B. E. A list of currently credible biology concepts judged by a national panel to be important for inclusion in K-12 curricula. Technical Report No. 145. (Ph.D. dissertation) 338 pp. in 3 vols. September 1970. ED 048 006.

The primary purpose of this study was to construct a list of currently credible biology concepts judged to be important for inclusion in K-12 curricula by a national panel of biologists, science educators, and high school biology teachers.

An initial list was created by asking a panel composed of University of Wisconsin biologists to list the five to seven most important concepts to which a student should be exposed. After compilation and reassessment a list of 114 concepts was presented to the national panel of 387.

All three groups of the national panel were similar in their rating and ranking of the 114 biology concepts; thus the utilization of university scientists was a successful method of creating a current, credible list of concepts.

Triezenberg, H. J. Testing for concepts of ecological systems. Practical Paper No. 3. 19 pp. January 1968. ED 020 906.

This paper contains a pretest on equilibrium and posttests of knowledge, comprehension, and application of concepts of ecological systems. The tests are a part of a study conducted at junior high school level.

Triezenberg, H. J. The use of an advance organizer in teaching selected concepts of ecological systems. Technical Report No. 42. 43 pp. February 1968. ED 020 909.

Nine televised lessons on ecological systems were presented to students in Grades 7 and 9 following presentation of an organizer at three levels of abstraction--verbal, sketch, and mechanical model.

Voelker, A. M. The relative effectiveness of two methods of instruction in teaching the classificational concepts of physical and chemical change to elementary school children. Technical Report No. 39. Out of print. 37 pp. February 1968. ED 020 908.

Through teacher-directed demonstration discussion, students in Grades 2-6 were instructed in the concepts of physical and chemical change; responsibility for formulating and stating the generalization for proper classification of the phenomena rested with the learner in one treatment and with the teacher in another.

A SYSTEM OF INDIVIDUALLY GUIDED MOTIVATION
5.2.60

Faculty Associate:
Herbert J. Klausmeier, Department of Educational Psychology

Project Coordinator:
James E. Walter

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Frayer, D. A., & Klausmeier, H. J. Modeling as a technique for promoting classroom learning and prosocial behavior. Theoretical Paper No. 39. 18 pp. October 1972. ED 073 409.

Research has shown that a behavior may be acquired through observing and imitating a model. A behavior which has already been acquired may be inhibited, disinhibited, or elicited by observing and imitating. A definition of imitation is given, and the effects of imitation on learning and performance are summarized. Research on factors which affect imitation is reviewed. These factors include the characteristics of the model, the characteristics of the observer, and the consequences of the behavior to the model and to the observer. Research on imitation of cognitive skills, subject matter knowledge, and prosocial behavior is also reviewed. Finally, techniques are outlined for the use of modeling to facilitate classroom learning and motivation.

Ghatala, E. S. Effectiveness of Individually Guided Motivation: A summary of the empirical evidence. Technical Report No. 355. 5.2.60.60.07.01.01. 138 pp. in 2 parts. December 1975.

The purpose of this report is to bring together, in a systematic way, the empirical evidence pertaining to the effectiveness of Individually Guided Motivation (IGM). This report, then, is intended for those who wish to become acquainted in some depth with the research on IGM, but who do not wish to read the numerous related Technical Reports in their entirety. Embodied in this report are edited excerpts from the most relevant of these research documents which have been issued by the Center since 1968, organized and placed in a context which provides a coherent picture of the evidence upon which IGM is based. A bibliography of Center research related to IGM is included at the end of this report.

This report is not intended as a guide for implementing any of the motivational procedures of IGM, nor is it intended to provide a comprehensive description of the IGM system. These types of information can best be obtained from the materials which have been shaped by the research reported herein.

Hubbard, W. D., & Zajano, N. *Group conferences to promote self-directed prosocial behavior: 1971-72 field test report*. Technical Report No. 255. 73 pp. July 1973. ED 085 640.

This paper reports the findings of a field test of the motivational-instructional procedure group conference to promote self-directed prosocial behavior. The field test was carried out in eight Wisconsin multiunit schools whose Instructional Improvement Committee members attended an inservice workshop given by Center staff. As a result of the inservice program the faculties successfully completed both the planning and organizational tasks needed to implement the procedure, and appropriately applied the motivational principles suggested for small-group conferences. Each school or unit developed its own list of prosocial behaviors which was used to measure the progress of all pupils. Different numbers of pupils from the schools were then chosen to participate in small-group conferences in which specific behaviors were discussed and individual goals were set.

The main conclusions were that (a) participating pupils improved significantly on those self-directed prosocial behaviors discussed in conferences, (b) this improvement was maintained when assessed six to eleven weeks after conferences ended, and (c) although the pupils chosen for conferences manifested significantly fewer prosocial behaviors before the conferences than those students not included, they manifested as many at the end of the conference period. It is assumed that schools would not normally end a conference period until their goals were met. The design of the field test, however, included a period without conferences to evaluate the long-term effects of the procedure.

Klausmeier, H. J., Allen, P., McGregor, E., & Walter, J. E. *A report on the utilization of Individually Guided Motivation*. Technical Report No. 388. 5.2.60.60.07.02.01. 75 pp. November 1976.

This report describes the results of two surveys designed to gain information about conditions of implementation and extent of utilization of the system of Individually Guided Motivation (IGM) in schools across the country.

In Chapter I the objectives and motivational principles of the IGM System and the instructional programing model on which it is based are presented.

In Chapter II, the purpose, method, and results of the first survey are reported.

Chapter III reports the results of the second survey, conducted in the fall of 1975. The specific focus was on access to, use of, and reactions to the various IGM print and film materials.

The final chapter summarizes the findings of the two surveys and discusses their implications for the implementation and utilization of the IGM system.

Quilling, M. R., Fischbach, T. J., Rendfrey, K. H., & Frayer, D. A. Individual goal-setting conferences related to subject-matter learning: A report on the field test. Technical Report No. 190. 47 pp. November 1971. ED 070 023.

The findings of a preliminary field test of the motivation package, Setting Individual Goals for Learning, are reported. In Phase I of the field test, 58 principals, unit leaders, and teachers showed gains in their knowledge of motivational principles and procedures after participating in a goal-setting inservice training session. To see whether the objectives of the program could be fulfilled in the classroom setting (Phase II), three schools implemented the goal-setting conferences in reading or mathematics. It was found that the teachers were able to implement the procedures described in the motivation package and apply motivational techniques in the conferences. The pupils gained significantly in number of skills attained weekly over the eight-week conference period. Furthermore, with discontinuation of the program, none of the pupils´ mean weekly rates of skill attainment regressed to that of the preconference baseline period.

Rendfrey, K., Frayer, D. A., & Quilling, M. R. Individually guided motivation: Setting individual goals for learning. Practical Paper No. 11. Out of print. 66 pp. January 1971. ED 057 412.

A system of individually guided motivation has been designed which identifies the motivational needs of children and describes programs to meet these needs. One of these programs consists of weekly individual teacher-student conferences to set goals in subject matter areas in which the student´s motivational level is low.

This practical paper is designed to explain the goal-setting program to teachers planning to implement it as a motivational technique. The paper describes how to (a) select subject-matter areas for goal-setting conferences; (b) develop goal check lists of behavioral objectives in a child´s own vocabulary; (c) identify students whose progress in the selected subject matter area suggests a lack of motivation; (d) schedule goal-setting conferences on a regular basis ten minutes weekly; (e) conduct conferences in which the motivational techniques of focusing attention, goal setting, reinforcement and feedback are implemented; (f) evaluate program implementation and effectiveness.

Sorenson, J. S., Schwenn, E. A., & Klausmeier, H. J. The individual conference--A motivational device for increasing independent reading in the elementary grades. Practical Paper No. 8. 43 pp. October 1969. ED 039 110.

The purpose of this paper is to describe in detail the implementation of individual adult-child conferences to increase independent reading.

Implementation procedures evolved from research experience with elementary school children over a three year period.

Stewart, D. M., Quilling, M. R., & Frayer, D. A. *Individual conferences to promote independent reading: A report on the field test*. Technical Report No. 185. 107 pp. November 1971. ED 070 071.

Individual Conferences to Promote Independent Reading is one of four classroom activities in the system of Individually Guided Motivation. A package of teacher-education materials designed to allow schools to implement the program of individual conferences was evaluated in six different school settings. Objectives were identified for both the conference leaders (direct target group) and the pupils participating in conferences (indirect target group). The conference leaders, after using the film, handbook, and user's manual included in the package, were assessed both by a paper-and-pencil test and by observation during the conferences. In all but one school, conference leaders were considered to have achieved an adequate level of knowledge and skill in conducting conferences. Conference leaders' responses to a questionnaire and their extension of the conference technique to other subject-matter areas indicated that they perceived the program as usable and effective.

Students in Grades 2-6 participated in the conferences. Significant gains in number of books read during an eight-week period were observed at all grades. A positive change in attitude toward reading was observed at all grades, with a significant change in Grades 4-6. Children participating in the conferences showed significant gains in reading skills. School variations in student gains were related to varying patterns of implementation.

Zajano, N., & Hubbard, W. D. *Guiding older children as tutors: 1972-73 field test report*. Technical Report No. 325. 5.2.60.60.04.01.01. 90 pp. July 1975.

The results of a field test of Guiding Older Children as Tutors, one of the four motivational-instructional procedures of Individually Guided Motivation (IGM), are reported. The procedure was used in two elementary schools during the 1972-73 school year. The results indicated an increase in the general level of motivation and self-direction of one group of tutees, but basically no change for the other. The tutees' motivation and self-direction during the tutoring sessions and while working on the tutored subject matter outside of the tutoring sessions did not increase, but started out and remained at a high level. When only tutored skills or items were considered, achievement of tutees increased more than that of comparison groups, however.

The tutors and school staffs demonstrated their ability to perform teaching and planning tasks, and the IGM materials proved sufficient to implement the program. The tutoring procedure itself was determined to be a feasible curriculum component for an elementary school if modified in terms of its demands on staff time.

INDIVIDUALLY GUIDED EDUCATION--SECONDARY
5.2.80

Associated Faculty:
Richard A. Rossmiller, Department of Educational Administration
Gerald Nadler, Department of Industrial Engineering
Thomas Popkewitz, Department of Curriculum and Instruction

Project Director:
Patrick W. Struve

Associate Scientist:
James V. Schultz

TECHNICAL REPORTS, THEORETICAL PAPERS, PRACTICAL PAPERS, AND BOOKS

Knezevich, S. J., & Way, R. The generation of multiunit school instructional organization models for secondary schools. Theoretical Paper No. 38. 38 pp. September 1972. ED 073 570.

Expressions of interest to extend IGE/multiunit school concepts to the secondary school level have come from many different quarters. The purpose of this theoretical paper is to describe a set of models for the instructional organization of the multiunit secondary school. The school's instructional organization is viewed as a mechanism for structuring resources to influence learning outcomes.

Koritzinsky, K. M., & White, S. J. I[illegible]-S: An instructional management system for secondary schools. Theoretical Paper No. 44. 5.2.80.10.01.01.01. 73 pp. August 1973.

This theoretical paper attempts to discuss the three major areas dealing with the IGE/MUS-S project. The paper provides the missing theoretical base by explaining in comprehensive form the significance and purpose of the project. IGE/MUS-S is described in terms of its operation as a project in the Wisconsin Research and Development Center; its commitment to an IGE system which provides continuous progress toward mutually established educational goals; its primary analytical tool--a three-part division of the functions of education; its role in the ongoing process of change and innovation in education; problems which plague the educational process; and a set of 50 working statements on learning psychology. The paper also presents a general model for an alternative educational program, reviews current developments in the seven component areas which provide the focal points for the project and discusses strategies and plans for implementation and future development.

Popkewitz, T. *The social structure of school and reform: A case study of IGE/S*. Technical Report No. 400. 5.2.80.60.01.01.11. 29 pp. October 1976.

This paper is concerned with the impact of the Individually Guided Education/Secondary Project in a middle school. Participation observation is used to understand how the intervention process is incorporated into everyday patterns and norms of the school. No individualization of instruction occurred. The findings suggest that basic teaching assumptions of the middle school staff remained unchallenged. Teachers saw the problem of reform as maintaining control and discipline so students would acquiesce to the authority of professionals. The IGE/S activities made the prevailing school orientations seem psychologically appealing. Further, the reform functioned externally to legitimize the school program within the larger communities.

Schultz, R. A. *Selected individual difference variables and their relationships to student perceptions of socio-psychological climates*. Technical Report No. 353. (Ph.D. dissertation) 5.2.80.15.02.01.05. 127 pp. August 1975.

The relationship of Locus of Control and Sensation Seeking to 267 high school students' perceptions of their Actual and Ideal socio-psychological climates as measured by the Learning Environment Inventory (LEI) was investigated. A principal components analysis of the LEI responses yielded three substantive dimensions: pleasantness index, relationship index, personal development index. Separate analyses of variance of the scores on the three components yielded significant Instruction and Locus of Control effects on pleasantness index. No other significant effects were found. Results were discussed in terms of the structure of the perceived environment and the relevance of individual difference measures for socio-psychological climates.

Schultz, J. V., Struve, P. W., & Nadler, G. *An alternative approach to systematic educational change*. Theoretical Paper No. 67. 5.2.80.24.01.11.03. 22 pp. October 1976.

This paper proposes a systematic change process for secondary schools that will enable them to achieve individualized and personalized learning for students. Included in the process are a perspective on change, planning issues and elements, a strategy for planning, a target/timeline framework, and a sequence for change. Finally, a purpose-oriented target secondary school is presented. It provides an idealized framework for moving toward individualized and personalized learning, as well as delineating possible procedures for operationalizing the target school.

CURRICULUM MATERIALS

DEVELOPING MATHEMATICAL PROCESSES (DMP)*

Level 1 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 1 (approximately kindergarten).

Level 1 Assessment Manual.

Manual for teachers to assist them in planning and carrying out assessment in DMP.

Level 1 Pupil Workbooks, Parts 1 and 2.

Consumable pupil instructional materials.

Level 1 Printed Materials Package.

This package includes printed record cards and nonconsumable materials such as stories, pictures, sorting cards, and direction cards for stations.

Level 2 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 2 (approximately Grade 1).

Level 2 Assessment Manual.

Manual for teachers to assist them in planning and carrying out assessment in DMP.

Level 2 Pupil Workbooks, Parts 1, 2, and 3.

Consumable pupil instructional materials.

Level 2 Pupil Test Booklets.

Consumable pupil assessment materials.

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*These materials are printed and distributed by Rand McNally & Company for use in field testing DMP.

Level 2 Printed Materials Package.

This package includes printed record cards and nonconsumable materials such as stories, pictures, sorting cards, and direction cards for stations.

Level 3 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 3 (approximately Grade 2).

Level 3 Assessment Manual.

Manual for teachers to assist them in planning and carrying out assessment in DMP.

Level 3 Pupil Workbooks, Parts 1, 2, and 3.

Consumable pupil instructional materials.

Level 3 Pupil Test Booklet.

Consumable pupil assessment materials.

Level 3 Printed Materials Package.

This package includes printed record cards and nonconsumable materials such as stories, pictures, sorting cards, and direction cards for stations.

Level 4 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 4 (approximately Grade 2).

Level 4 Assessment Manual.

Manual for teachers to assist them in planning and carrying out assessment in DMP.

Level 4 pupil Workbooks, Parts 1 and 2.

Consumable pupil instructional materials.

Level 4 Pupil Test Booklet.

Consumable pupil assessment materials.

Level 4 Printed Materials Package.

This package includes printed record cards and nonconsumable materials such as stories, pictures, sorting cards, and direction cards for stations.

Level 5 Teacher's Guide, Parts 1 and 2.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 5 (approximately Grade 3).

Level 5 Pupil Workbook, Parts 1, 2, and 3.

Consumable pupil instructional materials. Teacher's edition is also printed.

Level 5 Pupil Text, Parts 1 and 2.

Nonconsumable pupil instructional materials. Teacher's edition is also printed.

Level 5 Pupil Test Booklet, Parts 1 and 2.

Consumable pupil assessment materials. Teacher's edition is also printed.

Level 5 Printed Materials Package, Parts 1 and 2.

This package includes printed record cards and nonconsumable materials such as pictures, experiment cards, and game cards.

Level 6 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 6 (approximately Grade 4).

Level 6 Pupil Workbook, Parts 1, 2, and 3.

Consumable pupil instructional materials. Teacher's edition is also printed.

Level 6 Pupil Text.

Nonconsumable pupil instructional materials. Teacher's edition is also printed.

Level 6 Pupil Test Booklet.

Consumable pupil assessment materials.

Level 6 Printed Materials.

This package includes printed record cards and nonconsumable materials such as pictures, experiment cards, and game cards.

Level 7 Teacher's Guide.

This manual contains specific suggestions for classroom organization, materials, and instruction and assessment procedures. It coordinates the other components of Level 7 (approximately Grade 5).

Level 7 Pupil Workbook, Parts 1 and 2.

Consumable pupil instructional materials. Teacher's edition is also printed.

Level 7 Pupil Text, Parts 1and 2.

Nonconsumable pupil instructional materials. Teacher's edition is also printed.

Level 7 Pupil Test Booklet.

Consumable pupil assessment materials.

Level 7 Printed Materials.

This package includes printed record cards and nonconsumable materials such as pictures, experiment cards, and game cards.

WISCONSIN DESIGN FOR READING SKILL DEVELOPMENT

Wisconsin Tests of Reading Skill Development: Word Attack. (Developmental Edition)

A test battery and a test administrator's manual for each of four levels were printed in 1970 for use in field testing the Word Attack element. Out of print.

Teacher's Resource File: Word Attack. (Developmental Edition)

Printed in 1970 for use in field testing the Word Attack element, this consists of suggested teacher-led activities and a compendium of published materials. Out of print.

Teacher's Planning Guide: Word Attack. (Developmental Edition)

Printed in 1970 for use in field testing the Word Attack element, this manual provides information about implementation of Word Attack for classroom teachers. Includes Word Attack behavioral objectives. Out of print.

Rationale and Guidelines. (Developmental Edition)

Printed in 1970, this book provides basic information for implementing the Design for school management personnel. Includes behavioral objectives for all areas. Out of print.

Wisconsin Tests of Reading Skill Development: Study Skills. (Developmental Edition)

A test battery and a test administrator's manual for each of seven levels were printed in 1971 and 1972 for use in field testing the Study Skills element. Out of print.

Teacher's Resource File: Study Skills. (Developmental Edition)

Printed in 1971 and 1972 for use in field testing the Study Skills element, this consists of suggested teacher-led activities and a compendium of published materials. Out of print.

Teacher's Planning Guide: Study Skills. (Developmental Edition)

Printed in 1972 for use in field testing the Study Skills element, this manual provides information about implementation of Study Skills for classroom teachers. Includes Study Skills behavioral objectives. Out of print.

Wisconsin Tests of Reading Skill Development: Word Attack. (Commercial Edition)*

The Word Attack tests and test administrator's manuals, revised on the basis of field test results, are available commercially.

Teacher's Resource File: Word Attack. (Commercial Edition)*

The resource file was revised on the basis of feedback from field test schools and is available commercially.

Teacher's Planning Guide: Word Attack. (Commercial Edition)*

The manual was revised on the basis of feedback from field test schools and is available commercially.

Rationale and Guidelines. (First Edition)

The book was revised on the basis of feedback from field test schools and was printed in 1972. Includes final Word Attack behavioral objectives and preliminary behavioral objectives for other areas. Out of print.

Wisconsin Tests of Reading Skill Development: Study Skills. (Commercial Edition)*

The Study Skills tests and test administrator's manuals, revised on the basis of field test results, are available commercially.

Teacher's Resource File: Study Skills. (Commercial Edition)*

The resource file was revised on the basis of feedback from field test schools and is available commercially.

Teacher's Planning Guide: Study Skills. (Commercial Edition)*

The manual was revised on the basis of feedback from field test schools and is available commercially.

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*Price list and ordering information available from National Computer Systems, 4401 West 76th Street, Minneapolis, Minnesota 55435.

Rationale and Guidelines. (Second Edition)*

Includes final Word Attack and Study Skills behavioral objectives and preliminary behavioral objectives for other areas.

Teacher's Resource File: Self-Directed, Interpretive, and Creative Reading. (Developmental Edition)*

Printed in 1973 for use in field testing the Self-Directed Reading, Interpretive Reading, and Creative Reading elements, this consists of suggested teacher-led activities.

Teacher's Planning Guide: Self-Directed, Interpretive, and Creative Reading. (Developmental Edition)*

Printed in 1973 for use in field testing the Self-Directed Reading, Interpretive Reading, and Creative Reading elements, this manual provides information about implementation of Self-Directed Reading, Interpretive Reading, and Creative Reading for classroom teachers.

Wisconsin Tests of Reading Skill Development: Comprehension. (Developmental Edition)

A test battery and a test administrator's manual for each of seven levels were printed in 1974 for use in field testing the Comprehension element.

Teacher's Resource File: Comprehension. (Developmental Edition)

Printed in 1974 for use in field testing the Comprehension element, this consists of suggested teacher-led activities and a compendium of published materials.

Teacher's Planning Guide: Comprehension. (Developmental Edition)

Printed in 1974 for use in field testing the Comprehension element, this manual provides information about implementation of Comprehension for classroom teachers. Includes Comprehension behavioral objectives.

Rationale and Guidelines. (Third Edition)*

Includes final Word Attack, Study Skills, and Self-Directed, Interpretive, and Creative Reading behavioral objectives and preliminary behavioral objectives for other areas.

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*Price list and ordering information available from National Computer Systems, 4401 West 76th Street, Minneapolis, Minnesota 55435.

Teacher's Resource File: Self-Directed, Interpretive, and Creative Reading. (Commercial Edition)*

The resource file was revised on the basis of feedback from field test schools and is available commercially.

Teacher's Planning Guide: Self-Directed, Interpretive, and Creative Reading. (Commercial Edition)*

The manual was revised on the basis of feedback from field test schools and is available commercially.

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*Price list and ordering information available from National Computer Systems, 4401 West 76th Street, Minneapolis, Minnesota 55435.

PREREADING SKILLS PROGRAM

Wisconsin Basic Prereading Skill Tests, Form A.

The 1971-72 version contains five subtests. Small-scale field test of materials in 1971-72.

Wisconsin Basic Prereading Skill Tests, Form B.

The 1971-72 version contains five subtests. Small-scale field test of materials in 1971-72.

Wisconsin Basic Prereading Skill Tests, Administrator's Manual.

1971-72 Prereading Skills Program teacher materials. Small-scale test materials in 1972-73.

Teacher's Handbook.

1971-72 Prereading Skills Program teacher materials. Small-scale field test of materials in 1971-72.

Teacher's Resource File.

1971-72 Prereading Skills Program teacher materials. Small-scale field test of materials in 1971-72.

Visual Schedule.

1971-72 Prereading Skills Program teacher materials. Small-scale test of materials in 1971-72.

Sound Schedule.

1971-72 Prereading Skills Program teacher materials. Small-scale field test of materials in 1971-72.

The Prereading Skills Program. (Booklet, September 1971)

1971-72 Prereading Skills Program teacher materials. Small-scale field test of materials in 1971-72.

The Prereading Skills Program: An Overview Booklet for Primary Teachers. (May 1972)

1971-72 Packet containing a booklet and sample materials for new teachers of children who used the program. Small-scale field test of materials in 1972-73.

Inservice Manual.

1972-73 Prereading Skills Program teacher training materials. Small-scale field tests of materials in 1972-73.

Prereading Skills Test.

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Prereading Skills Test, Administrator's Manual.

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Teacher's Handbook

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Teacher's Resource File.

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Visual Schedule.

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Sound Schedule.

1972-73 Prereading Skills Program teacher materials. Small-scale field test of materials in 1972-73.

Prereading Skills Test.

1973-74 Prereading Skills Program teacher materials. Small-scale field test of materials in 1973-74.

Teacher's Resource File.

1973-74 Prereading Skills Program teacher materials. Small-scale field test of materials in 1973-74.

Visual Schedule.

1973-74 Prereading Skills Program teacher materials. Small-scale field test of materials in 1973-74.

Sound Schedule. Part I.

1973-74 Prereading Skills Program teacher materials. Small-scale field test of materials in 1973-74.

Sound Schedule. Part II.

1973-74 Prereading Skills Program teacher materials. Small-scale field test of materials in 1973-74.

Overview for Primary Teachers.

1972-73 packet containing a booklet and sample materials for new teachers of children who used the program.

Filmstrips.

Small Group Games: Core of Instruction. 1974. Color.

The Prereading Skills Program: An Overview. Sound filmstrip and accompanying script. Available from the CCL Document Service. $15.00.

Prereading Skills Tests.

Large-group adaptation of the commercial version of the Prereading Skills Tests. Field tested in 1975-76.

Administrator's Manual.

A manual for the large-group version of the Prereading Skills Tests. Field tested in 1975-76.

Vocabulary Segment of PRS: 1975-76.
Teacher's Guide Folder
Schedule Book
Language Arts Supplement
Vocabulary File cards

Supplementary set of teacher materials for use with the commercial version of Prereading Skills. Field tested in 1975-76.

WISCONSIN RESEARCH AND DEVELOPMENT CENTER

CCL DOCUMENT SERVICE MATERIALS

CCL DOCUMENT SERVICE MATERIALS

All items in this section have been published or produced by the Wisconsin Research and Development Center and are available from the CCL Document Service, 1025 West Johnson Street, Madison, Wisconsin 53706. Prices are subject to change. Please include check or purchase order with orders.

INDIVIDUALLY GUIDED MOTIVATION

Individually Guided Motivation. This book deals with the theory and practice of IGM. It is intended for teachers using the program and for college instructors teaching a course on IGM. 159 pp. $3.00.

Inservice Implementation Manual for IGM. This is an inservice manual for those implementing a program of IGM. 107 pp. $1.00.

College Instructor's Guide for IGM. This is a guide for college instructors conducting an inservice or preservice program on IGM. 71 pp. $1.00.

A system of IGM. This is a Practical Paper which describes IGM. 28 pp. $1.00. Complimentary copy sent with purchase of College Instructor's Guide.

IGM: Setting Individual Goals for Learning. This is a Practical Paper describing the process of setting learning goals for individual students. 66 pp. $1.00. Complimentary copy sent with purchase of College Instructor's Guide.

A Guide for Adult-Child Reading Conferences. This is a guide for unit leaders, teachers, or aides who conduct adult-child reading conferences. 33 pp. $1.00.

Tutoring Can Be Fun: A Guide for Tutors. This book explains to children or adults how to tutor. 54 pp. $1.75.

Individually Guided Motivation. This brochure gives an overview of the IGM program. 8 pp. Single copies free from the R & D Center information office.

IGE FILMS

There are five 16mm color films about IGM, each about 15 minutes long. Each film may be rented for $3.00 per day plus $5.00 handling charge. Films may be purchased for $85.00 each except the tutoring film, which is $42.50. The complete set of five films is $305.00.

IGM: An Overview. This film is an overview of the IGM system.

Encouraging Independent Reading. This film shows how adults conduct conferences with individual children to promote independent reading.

Setting Individual Goals for Learning. This film shows how a teacher and child set learning goals for the child in short conferences.

Guiding Children as Tutors. This film shows how older children can tutor younger children.

Guiding Children Toward Self-Directed Behavior. This film shows how teachers can use small-group conferences with students to encourage self-directed behavior.

INDIVIDUALLY GUIDED EDUCATION

IGE Implementor's Manual. This is a practical guide to assist schools and implementors in the implementation of IGE. It describes the implementor's role, the IGE implementation phases, the sequence of staff development activities in each implementation phase, and materials needed for each activity. It includes masters for handouts and transparencies. Loose-leaf in binder. Currently being revised. Write for price information.

IGE Implementor Simulation Series. This kit contains all necessary materials for simulations on the four phases of IGE implementation. The simulations are designed to familiarize prospective IGE implementors with essential procedures, materials, and considerations for IGE implementation. Materials are reuseable. $40.00.

IGE Curriculum Products Packages. There are four packages in this set. Each deals with one of the four R & D Center curriculum products: Individually Guided Motivation, Developing Mathematical Processes, Pre-reading Skills, and the Wisconsin Design for Reading Skill Development. Each package includes a filmstrip with audio cassette which runs about 10 minutes and a reproduceable fact sheet. The packages are designed for a general audience. Individual packages are $15.00; a set of four, $50.00.

One-Day Instructional Programming Workshop. This booklet contains guidelines and materials for conducting a one-day workshop on individualizing instruction with the Instructional Programming Model. The workshop is primarily intended to be conducted for the staff of a single school. It requires a workshop coordinator experienced in IGE. 118 pp. $4.75.

IGE Instructional Leadership Workshop: An Alternative. This loose-leaf package presents guidelines and materials for a five-day workshop on individualizing instruction through IGE. It is similar to the One-Day Workshop above, but more comprehensive. The workshop is intended primarily for staffs of schools which decided to implement IGE. 326 pp. $7.75.

IGE Performance Objectives. This pamphlet lists in chronological sequence the performance objectives for attaining a program of IGE. Schools will find the pamphlet useful as a guide during implementation and as a tool for evaluating the implementation program. 34 pp. $1.50.

IGE Performance Objective Resource File. This is a set of 79 file-folders (one keyed to each performance objective) which contains a large amount of information on effective school practices, related research, and additional references. The Resource File is recommended for schools implementing IGE. $45.00.

Franklin Elementary School Simulation Series. This is a series of 11 simulations, each focusing on a different problem that many schools have encountered in implementing IGE. Each is intended to help participants to learn about the problem dealt with in the simulation and to develop small-group problem-solving skills. Simulations are intended for school personnel or for teacher education students. Each simulation is complete. Materials must be duplicated. $3.00 each; complete set of 11, $20.00. Titles are:

Establishing IIC Operational Guidelines and Procedures
Grouping Students for Learning
Establishing a Systemwide Program Committee
Organizing a Multiunit School
Establishing Decision-Making Guidelines for the IIC
Improving Instructional Practices
Establishing a School Philosophy
Establishing a Reporting Policy
Using the Performance Objectives in Implementing IGE
Managing Unit Time
Establishing a Procedure for Allocating Money for
  Requisitioning Materials

A Decade of Impact. This brochure reviews the accomplishments of the R & D Center's first decade. 16 pp. Single copies free from the R & D Center information office.

The Development and Evaluation of the Multiunit Elementary School 1966-70. This Technical Report gives detailed information on the early days of IGE. 16 pp. $1.00.

IGE: Focus on the Multiunit School. Descriptive brochure. 12 pp. Single copies free from the R & D Center information office.

Simformation I: Introducing Parents to the Wisconsin Reading Design. This guide outlines a series of simulation-information activities designed to help parents understand the Wisconsin Design. Simformations II through VI, dealing with other topics in the area of home-school-community relations, are currently in production. Write for price and availability information.

IGE Audiovisual Package. This is a set of five filmstrips and 14 overhead transparencies. The five filmstrips, each about 10 minutes, are:

"Instructional Programming in IGE." This describes use of the Instructional Programming Model.

"Multiunit Elementary School: Organization and Operations." This describes organization, communication, and decision making in the multiunit school.

"Multiunit Elementary School: Roles and Responsibilities." This describes roles and identifies responsibilities of multiunit school staff members.

"Grouping Patterns." This demonstrates various grouping patterns used to meet individual student needs.

"Assessment in IGE." This demonstrates how to assess children's progress in subjects taught with IGE.

The 14 transparencies include 10 on the Instructional Programming Model (with an instruction guide), three on the structure of the multiunit school, and one depecting the seven components of IGE. Complete package, $75.00. Filmstrips, $5.00 each; transparency set, $25.00.

Think Kids! This 16mm color film gives an overview of IGE by looking at three IGE schools in different parts of the country. Intended for parents, community members, and professionals new to IGE. About 30 minutes. $125.00; rental: $3.00 a day plus $5.00 handling.

MISCELLANEOUS

A Structure of Concept Attainment Abilities.
Instruments for Measuring Cognitive Abilities at the Intermediate Grade Level--Manual and Tests.

This 394-page monograph contains detailed validity, reliability, and norming information on two test batteries for four samples of fifth grade boys and girls as well as a full report of the study.

The test packet contains 37 tests, reproducible for research purposes, and designed to measure cognitive abilities at the intermediate grade level. Seven latent cognitive abilities underlie the test battery: Verbal, Induction, Numerical, Word Fluency, Memory, Perceptual Speed, and Simple Visualization. Three tentative factors are also identified: Spatial, Evaluation, and Seeing Relationships. A supplementary 58-page manual presents summary statistics and a discussion of the findings from the factorial study of the test batteries. The tests are described and answer keys are included. The monograph is $5.75; the manual and tests are $12.50; the complete set is $15.00.

NUMERICAL LISTING

NUMERICAL LISTING

TECHNICAL REPORTS

No. 1

Klausmeier, H. J., Davis, J. K., Ramsay, J. G., Fredrick, W. C., & Davies, M. H. *Concept learning and problem solving: A bibliography, 1950-1964.* Technical Report No. 1. Out of print. 80 pp. October 1965. ED 010 201. Replaced by Technical Report No. 82.

No. 2

Goodwin, W. L. *The effects on achievement test results of varying conditions of experimental atmosphere, notice of test, test administration, and test scoring.* Technical Report No. 2. Out of print. 44 pp. November 1965. ED 010 202.

No. 3

Fredrick, W. C. *The effects of instructions, concept complexity, method of presentation, and order of concepts upon a concept attainment task.* Technical Report No. 3. (Master's thesis) Out of print. 26 pp. November 1965. ED 010 203.

No. 4

Ramsay, J. G. *The attainment of concepts from figural and verbal instances, by individuals and pairs.* Technical Report No. 4. (Master's thesis) Out of print. 13 pp. January 1966. ED 010 204.

No. 5

Van Engen, H., & Steffe, L. P. *First grade children's concept of natural numbers.* Technical Report No. 5. Out of print. 13 pp. February 1966. ED 010 508.

No. 6

Lynch, D. O. *Concept identification as a function of instructions, labels, sequence, concept type, and test item type.* Technical Report No. 6. (Master's thesis) Out of print. 16 pp. June 1966. ED 101 212.

No. 7

Biaggio, A. M. B. *Relative predictability of freshman grade-point averages from SAT scores in Negro and white southern colleges.* Technical Report No. 7. (Master's thesis) 31 pp. 1966. ED 010 509.

No. 8

Kalish, P. W. *Concept attainment as a function of monetary incentives, competition, and instructions.* Technical Report No. 8. (Master's thesis) 16 pp. September 1966. ED 010 510.

No. 9

Baldwin, T. L., & Johnson, T. J. *Teacher behaviors and effectiveness of reinforcement*. Technical Report No. 9. 22 pp. 1966. ED 010 511.

No. 10

Fang, M. C. S. *Effect of incentive and complexity on performance of students from two social class backgrounds on a concept identification task*. Technical Report No. 10. (Master's thesis) 24 pp. September 1966. ED 010 512.

No. 11

Lemke, E. A., Klausmeier, H. J., & Harris, C. W. *The relationship of selected cognitive abilities to concept attainment and information processing*. Technical Report No. 11. 17 pp. October 1966. ED 010 513.

No. 12

Burmeister, L. E. *An evaluation of the inductive and deductive group approaches to teaching selected word analysis generalizations to disabled readers in eighth and ninth grades*. Technical Report No. 12. (Ph.D. dissertation) Out of print. 41 pp. November 1966. ED 010 514.

No. 13

Boe, B. L. *Secondary school pupils' perception of the plane sections of selected solid figures*. Technical Report No. 13. (Ph.D. dissertation) 33 pp. November 1966. ED 010 515.

No. 14

Steffe, L. P. *The performance of first grade children in four levels of numerousness and three I.Q. groups when solving arithmetic addition problems*. Technical Report No. 14. Out of print. (Ph.D. dissertation) 57 pp. December 1966. ED 016 535.

No. 15

Sweet, R. C. *Educational attainment and attitudes toward school as a function of feedback in the form of teachers' written comments*. Technical Report No. 15. (Master's thesis) 12 pp. November 1966. ED 015 163.

No. 16

Weissglass, R. R. *The effect of memory span on cue patterns in word recognition*. Technical Report No. 16. (Master's thesis) 16 pp. December 1966. ED 015 111.

No. 17

Blount, N. S., Klausmeier, H. J., Johnson, S. L., Fredrick, W. C., & Ramsay, J. G. *The effectiveness of programed materials in English syntax and the relationship of selected variables to the learning of concepts*. Technical Report No. 17. 52 pp. January 1967. ED 013 256.

No. 18

Bourne, L. E., Jr., Dodd, D. H., Guy, D. E., & Justesen, D. R. *Response-contingent postfeedback intervals in concept identification*. Technical Report No. 18. 11 pp. February 1967. ED 013 980.

No. 19

Klausmeier, H. J., Cook, D. M., Goodwin, W. L., Tagatz, G. E., & Pingel, L. *Individualizing instruction in language arts through development and research in R & I Units of local schools, 1965-1966*. Technical Report No. 19. Out of print. 25 pp. February 1967. ED 013 255.

No. 20

Pella, M. O., & Ziegler, R. E. *The use of static and dynamic mechanical models in teaching aspects of the theoretical concept "The Particle Nature of Matter."* Technical Report No. 20. Out of print. 50 pp. March 1967. ED 013 205.

No. 21

Steffe, L. P. *The effects of two variables on the problem-solving abilities of first grade children*. Technical Report No. 21. Out of print. 17 pp. March 1967. ED 019 113.

No. 22

Staats, A. W., Minke, K. A., Goodwin, W. L., & Landeen, J. *"Motivated Learning" reading treatment with additional subjects and instructional technicians*. Technical Report No. 22. 15 pp. March 1967. ED 015 110.

No. 23

Conry, J. J. *Validity of the rearrangement exercise as a predictor of essay writing ability*. Technical Report No. 23. (Master's thesis) 19 pp. May 1967. ED 016 464.

No. 24

Porter, A. C. *A chi-square approach to discrimination among occupations, using an interest inventory*. Technical Report No. 24. (Master's thesis) 41 pp. May1967. ED 040 298.

No. 25

Houston, T. R., Jr. *On the construction of Latin squares counterbalanced for immediate sequential effects*. Technical Report No. 25. (Master's thesis) 19 pp. May 1967. ED 013 981.

No. 26

Davis, G. A., Train, A. J., & Manske, M. E. *Trial and error vs. "insightful" problem solving: Effects of distraction, additional response alternatives, and longer response chains*. Technical Report No. 26. 10 pp. May 1967. ED 013 982.

No. 27 Smuckler, N. S. *Concept formation as a function of method of presentation and ratio of positive to negative instances*. Technical Report No. 27. (Master's thesis) 24 pp. June 1967. ED 015 779.

No. 28 Smith, R. J. *The effects of reading a short story for a creative purpose on student attitudes and writing*. Technical Report No. 28. (Ph.D. dissertation) Out of print. 29 pp. July 1967. ED 017 437.

No. 29 Schotanus, H. D. *The relationship between difficulty of reading material and attitude toward reading*. Technical Report No. 29. (Master's thesis) 14 pp. July 1967. ED 016 596.

No. 30 Allen, V. L., & Bragg, B. W. *Effect of group pressure on memory*. Technical Report No. 30. 11 pp. September 1967. ED 016 600.

No. 31 Allen, V. L., & Bragg, B. W. *Effect of social pressure on concept identification*. Technical Report No. 31. 9 pp. September 1967. ED 016 597.

No. 32 Davis, J. K. *Concept identification as a function of cognitive style, complexity, and training procedures*. Technical Report No. 32. (Ph.D. dissertation) Out of print. 28 pp. October 1967. ED 024 167.

No. 33 Allen, V. L., & Levine, J. M. *Creativity and conformity*. Technical Report No. 33. 11 pp. November 1967. ED 019 747.

No. 34 Olton, R. M., Wardrop, J. L., Covington, M. V., Goodwin, W. L., Crutchfield, R. S., Klausmeier, H. J., & Teckla, R. *The development of productive thinking skills in fifth grade children*. Technical Report No. 34. 39 pp. November 1967. ED 021 312.

No. 35 Wardrop, J. L., Cook, D. M., Quilling, M., Klausmeier, H. J., Espeseth, C., & Grout, C. *Research and development activities in R & I Units of two elementary schools of Manitowoc, Wisconsin, 1966-1967*. Technical Report No. 35. Out of print. 8 pp. November 1967. ED 019 796.

No. 36

Carey, R. L. *Relationship between levels of maturity and levels of understanding of selected concepts of "The Particle Nature of Matter."* Technical Report No. 36. Out of print. 68 pp. January 1968. ED 020 131.

No. 37

Severin, W. *Cue summation in multiple-channel communication.* Technical Report No. 37. 12 pp. January 1968. ED 021 463.

No. 38

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